# new BAKER gas-O-matic

## . . . ELECTRIC TRUCK OPERATING ECONOMY
## . . . . . GAS TRUCK INITIAL COST !

**gas-O-matic** has the smoothest acceleration and best "inching" characteristics of any fork truck, regardless of type of fuel or transmission. It is ideal for ramp work, for tiering, and for long or short haul operations. In fact it will perform almost any fork truck job better and cheaper.

**gas-O-matic** is a revolutionary new gasoline-powered fork truck with electric motor drive—designed from engine to drive wheels to incorporate the best features of both gas and electric trucks.

The secret of its outstanding performance and amazing operating economy is the new Baker GAS-O-MATIC transmission system. A specially designed variable voltage generator provides an incredibly smooth *unbroken* acceleration curve —directly controlled by the gas throttle.

***ELIMINATION OF CLUTCH*** cures the biggest maintenance headache of gas-powered trucks.

***ELIMINATION OF CLUTCH AND GEAR SHIFT*** prevents jerky starts and "step-ladder" acceleration.

***ELIMINATION OF CONTROLLER AND RESISTANCE BANKS*** of electric and gas-electric trucks means fewer moving parts and results in less down time and lower maintenance costs.

**gas-O-matic** will do everything a comparable straight gas truck can do—do most of it better and more economically . . . plus some things that straight gas cannot do.

It will do almost everything a battery-powered fork truck can do—and some of it better . . . plus a few things that battery-power cannot do!

—Yet it costs little more* than a straight gas truck of the same capacity, and only about half as much as a battery-powered electric with charger and two batteries!

* **gas-O-matic** *model illustrated, 4,000 lb. capacity costs only* **$4895.00**

THE BAKER-RAULANG CO. 1853 100th anniversary 1953 THE BAKER-RAULANG CO.

*write for descriptive Bulletin No. 1344*

**THE BAKER-RAULANG COMPANY**
**1251 WEST 80th STREET • CLEVELAND 2, OHIO**

**Baker**
**industrial trucks**

*The Baker-Lull Corporation, Subsidiary, Minneapolis, Minnesota*
*Material Handling and Construction Equipment*

**For more facts circle 502 on Reply Card**

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# 'ROUND ABOUT with the editors in field and office

*Edited by R. L. Marinello*

## Magazine Editors Interview New Treasury Department Head

**W. Randolph Burgess,** Treasury deputy and consultant on debt management, was interviewed by business magazine editors in Washington recently.

The photograph of this meeting (see cut) was used on the March cover of *Banking*, the Journal of the American Bankers Association. The editors are members of the Society of Business Magazine Editors, a professional society of leading industrial magazines, which meets in Washington bi-monthly

to keep in touch with governmental activities. The Circle and Quill emblem of the Society appears near the top of the column on the left. **Richard H. Morris,** Editorial Director of PLANT ENGINEERING, and a member of the executive committee of Society of Business Magazine Editors, is in the front row, second from right.

## National Electronics Conference

THE NATIONAL Electronics Conference will be held on September 28, 29 and 30, at the Hotel Sherman in Chicago.

Additional information about this conference can be obtained from S. R. Collis, Chairman, N. E. C. Publicity Committee, Illinois Bell Telephone Co., 208 W. Washington St., Chicago.

## Definition of Contract Terms

A GLOSSARY OF TERMS used in methods, time study and wage incentives, promises to cut down previous wrangling, aimless discussion and hair-splitting interpretations over contract language.

Each of the 332 terms and expressions in the booklet is defined on the basis of its interpretations by the greatest number of experienced people using them professionally.

The information is presented in vest-pocket format and is No. 104 of a series of publications issued by the Society for Advancement of Management, 411 Fifth Ave., New York 16, N. Y. It is priced at $1.00 per copy.

## Feedback Control Course

A SPECIAL summer program, presenting a formalized theory for the analysis and synthesis of Feedback Control Systems, will be given at the Massachusetts Institute of Technology from June 22 to July 3.

The first week of the summer program will be devoted to a review of the theory of measurement and feedback control. The second week will deal with advanced subjects, such as contactors, pulse control mechanisms, data sampling, distributed parameter systems, pneumatic and thermal systems, random signals and loads, and non-linear systems.

Further information on the summer program in Feedback Control Systems may be obtained from Professor E. H. Huntress, Director of the Summer Session, Room 3-107, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

## Industrial Design Scholarship

A FULL TUITION scholarship for a beginning student in industrial design has been established at the Philadelphia Museum School of Art by The Yale and Towne Mfg. Co., Yale Materials Handling Div., Philadelphia.

The award, to be known as the Yale Materials Handling Scholarship, will be given by the scholarship committee of the school to a beginning student in industrial design. It will be made on the basis of merit and need.

## Plant Engineering Club News

**Chicago:** On April 10, the Plant Engineers' Society of Chicago held its annual meeting. The prime purpose of this gathering was the selection of officers and discussion of programs for the 1953-54 year.

The new officers will be: **C. E. Burns,** A. B. Dick Co., president; **H. B. Zoeter,** Continental Can Co., Inc., vice president; and **T. S. Ramond,** Goodman Manufacturing Co., secretary-treasurer. **D. F. Redman,** International Harvester Co., and

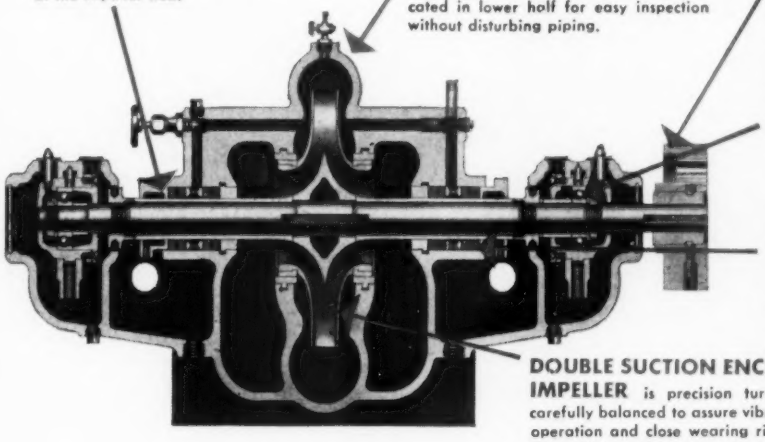
(Continued on page 6)

*Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.*

# Look for These 7 Signs of GOOD PUMP DESIGN

**CAST SHAFT SLEEVES,** not commercial tubing, save the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.

**HEAVY HORIZONTAL SPLIT CAST-IRON CASING** construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.

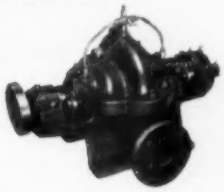


**COUPLINGS** have *Magic-Grip* quick change bushings for pump and drive shaft. Pin and rubber bushing type usually used. Removal for maintenance is easy.

**BALL BEARINGS** may be furnished for either oil or grease lubrication. Sleeve bearings also available in larger sizes.

**GENEROUS STUFFING BOX LENGTH** contains sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.

**DOUBLE SUCTION ENCLOSED IMPELLER** is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.



**STANDARD AND SPECIAL MATERIALS** are available for many types of service where government regulations permit. Iron, bronze, stainless steel and combinations of these materials handle both alkaline and acid solutions. Standard sizes carried in stock range from 10 to 7000 gpm with heads as high as 475 feet.

**ALLIS-CHALMERS Double Suction PUMPS**

**THESE DESIGN AND CONSTRUCTION** features of Allis-Chalmers double suction pumps assure long pump life and low maintenance costs. Every A-C double suction pump is carefully tested on the most modern pump testing equipment in the industry.

### Complete Pumping Unit

Allis-Chalmers can furnish the complete pumping unit — pump, motor, control and drive — all of coordinated design and manufacture.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Distributor or District Office. Or write for Bulletin 08B6146. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3952

*Texrope, Magic-Grip, and Vari-Pitch* are Allis-Chalmers trademarks.

***Sold . . .***
***Applied . . .***
***Serviced . . .***

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

**MOTORS** — ½ to 25,000 hp and up. All types.

**CONTROL** — Manual, magnetic and combination starters; push button stations and components for complete control systems.

***TEXROPE*** V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

# ALLIS-CHALMERS

**For more facts circle 503 on Reply Card**

**Low-cost, low-upkeep cabinets of easy-to-use fir plywood meet your exact space needs**

DURABILITY, low-upkeep and convenience of custom construction are just a few of the advantages of fir plywood cabinets and fixtures.

Plywood helps you build faster—at lower in-place costs. Large panels speed work, simplify framing. Low cost fir plywood is easy to work with ordinary tools . . . won't chip, split or puncture. Easy to finish, too. It's factory-seasoned, dimensionally stable, true in size. For Basic Plywood Catalog or other data, write Douglas Fir Plywood Association, Tacoma 2, Washington.

**Fir Plywood**

**Industry trademarks are your guide, guard and assurance of DFPA quality-tested plywood**

Fir plywood is made in two types: 1. *Interior-type* for indoor and structural uses; 2. *Exterior-type* for uses exposed to water or weather. EXT-DFPA on panel edge means 100% waterproof glue. Grades within each type meet exact use needs.

EXT-DFPA

PlyPanel is the versatile "one-side" grade of Interior-type. Use it for cabinets, lockers, other indoor jobs where only one side of the panel will be in view.

INTERIOR FIR PLYWOOD
PLYPANEL
DFPA INSPECTED

**There's a type and grade of fir plywood for every use**

**For more facts circle 504 on Reply Card**

**J. Balla,** Allen B. Wrisley Co., will serve as senior and junior board members, respectively, for the coming year.

**Philadelphia:** On April 7, the Greater Philadelphia Plant Engineers' Club met at the Poor Richard Club. **Richard H. Morris,** Editorial Director of PLANT ENGINEERING, spoke on the subject, "Organizing and Conducting Group Conferences."

The talk covered: the place of group meetings in modern industrial organizations; how to analyze the problem involved; preparation for the conference; conducting the meetings; and the duties of the chairman during the meeting.

## Steel Castings Manual

REPRINTED IN manual format, a 16-page illustrated booklet, "Carbon and Low Alloy Steel Castings," covers many applications of steel castings.

Steel casting properties, specifications, design, joining, heat treating and inspection procedures are discussed. A two-page chart devoted to general engineering types of steel castings, classified according to tensile strengths, is also included.

Copies of this manual may be obtained by writing to F. Kermit Donaldson, executive vice president, Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio.

## Construction of New Plants

**Colorado Fuel and Iron Corp.** is constructing a new seamless tube mill at Pueblo, Colorado . . . **General Electric Co.** is building a power transformer plant at Rome, Georgia. In this new plant, power transformers will be entirely assembled for the first time by production line methods . . . **Hawker Mfg. Co.** is nearing the completion of its new plant adjacent to its present facilities at Dayton, Ohio . . . **Hoffmann-LaRoche, Inc.** is building a new three-story addition to its Nutley, N. J., manufacturing facilities.

## New Emery Aggregate Mill Dedicated at Peekskill

ASSISTED BY a governor, mayor and friends from as far away as Chicago, Walter Maguire dedicated a new $100,000 mill at Peekskill, New York, April 9. The mill is unique in that it is designed and built for the sole purpose of processing natural emery into aggregate for heavy-duty flooring. In 1939, this was only an idea; today it has developed into a business marketing 15 million pounds of aggregate a year.

Peekskill boasts the only area with commercially worked deposits of natural emery in the United States. The largest reserves are owned and operated by the DeLucia Emery Mining Co. The output of this company is processed by the Cortland Stone Co. into Cortland Emery Aggregate and this is distributed by the Walter Maguire Co. as the basic ingredient of Emeri-Crete flooring.

Located at Center Dock, Peekskill, the new mill is of rustic timber construction, with a steel-framed, aluminum-sheathed warehouse section. Selected emery from the mine is crushed, screened and packaged into 100-lb sacks in the mill. The finished sizes range all the way from fines to ⅜ in.

Vibrating conveyors and electronically controlled scales control the proper proportioning of the different sizes into 100-lb paper bags. Conveyors carry the bags to the warehouse section where they are palletized for shipment. The mill is equipped with dust collecting, filter and disposal system.

# 'ROUND ABOUT

## Electricity — Atomic-Style

THE PRODUCTION OF useful amounts of electric power by nuclear energy has been achieved from successful operation of a new type reactor—the experimental homogeneous reactor. It was recently tested at Oak Ridge National Laboratory, Tennessee, which is operated by Union Carbide and Carbon Corporation for the Atomic Energy Commission.

A pilot-model of the reactor system was brought up to its full design power of 1000 kw of heat output. The reactor steam then was switched to a turbine-generator and about 150 kw of electricity was produced. This is enough electricity to meet the estimated needs of 50 average five-room dwellings.

This homogeneous reactor is capable of producing both fissionable material and electric power, and is the first to operate at a temperature and power high enough for production of steam to run a standard industrial turbine-generator.

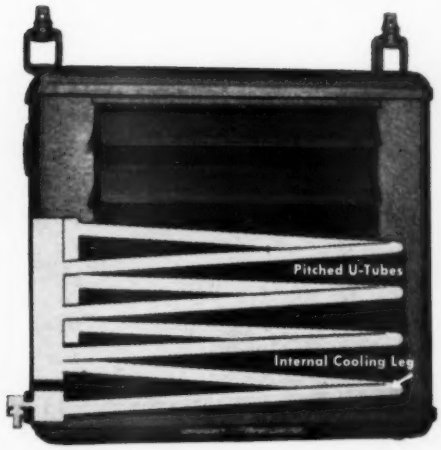
Although there are many problems that have yet to be solved, this demonstration of the feasibility of homogeneous liquid-fuel reactor systems is an important milestone toward economical production of electricity by means of nuclear reactors.

## Personnel Changes

**Woodrow W. DeMuth** was recently appointed superintendent of plant engineering at Servel, Inc., Evansville, Indiana.

**Duncan R. McLeish** will now head the maintenance departments of the McCarty Street plant of Eli Lilly and Co., Indianapolis, Indiana.

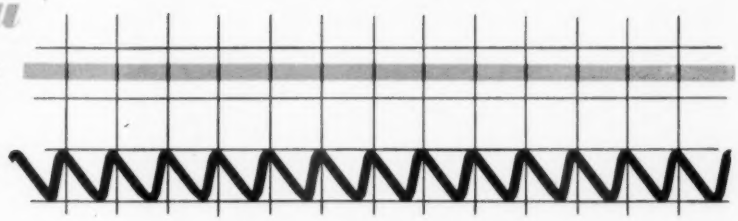
**Edwin O. Crawford** will head the mechanical and structural engineering sections of A. E. Staley Mfg. Co., Decatur, Illinois.




when buying unit heaters

*be sure you get this*

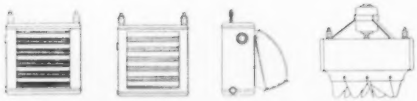
**...not this!**



With **THERMOLIER**...

the Grinnell Unit Heater . . . you get

CONTINUOUS RATED CAPACITY



Horizontal Delivery | Textile Model | Velocity Nozzle | Vertical Delivery

**THERMOLIER FEATURES**

**INTERNAL COOLING LEG** A Grinnell feature which permits the use of a plain thermostatic trap for draining condensate.

**PITCHED U-TUBES** Built-in pitch of U-tubes provides complete drainage of condensate and elimination of destructive water hammer.

**CONTINUOUS RATED CAPACITY** The combination of Thermolier's internal cooling leg and the built-in pitch of tubes assures continuous rated capacity.

**BUILT-IN EXPANSION PROVISIONS** Every tube is an expansion bend of the U type to allow for independent expansion and contraction of each tube.

**TUBE-TO-HEADER CONSTRUCTION** Safety and durability assured by unique tube-to-header construction.

**EASE OF ERECTION** Exclusive with Thermolier are the adjustable swivel couplings which provide an easy, cost-saving method of hanging the unit.

**SIMPLE PIPE CONNECTIONS** The supply and return piping connections are on the same side to assure compactness, neatness and economy in installation.

**MOTORS** Thermolier motors are built specifically for unit heater duty. They give maximum operating efficiency with minimum power cost.

The practical advantages of unit heating, of course, are well known. But in order to get *maximum* economy and efficiency, certain engineering and structural features *must be* present in the unit heater of your choice.

Take provisions for draining off condensate. Failure to provide freedom from collected condensate in the heating element can interfere with heat output and adversely affect capacity.

A Thermolier Unit Heater successfully handles this drainage problem with its pitched U-tubes and internal cooling leg, through which all the condensate passes. In fact, condensate cooling is so efficient with Grinnell Thermoliers that a thermostatic trap — the simplest and least expensive of all traps — can be used with every model. Condensate temperature is lowered to the point where the trap is always draining — giving Thermolier Unit Heaters their *continuous rated capacity*.

Check Thermolier's advantages at left. For more details, call your local Grinnell distributor — or send for catalog.

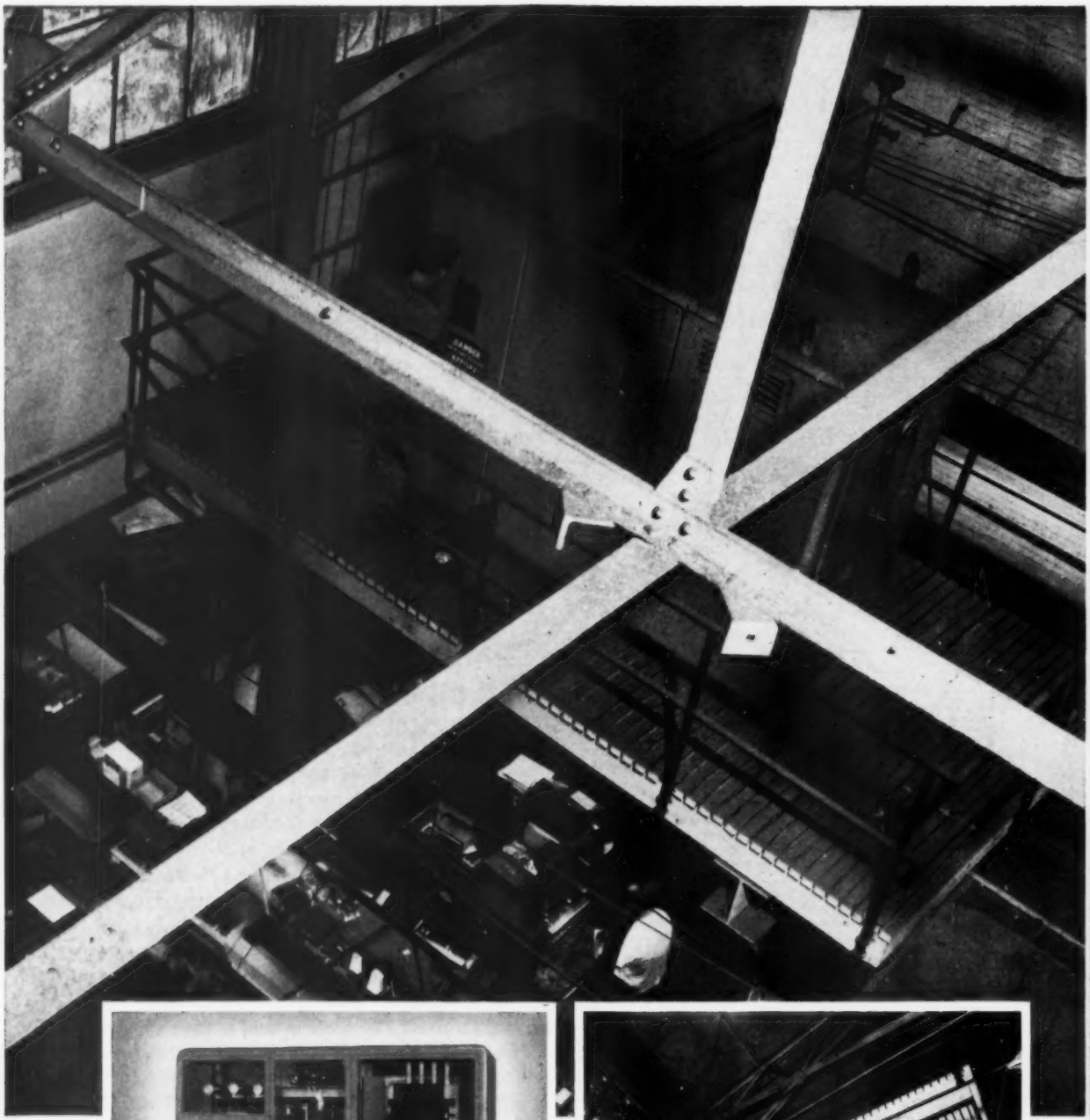
# GRINNELL

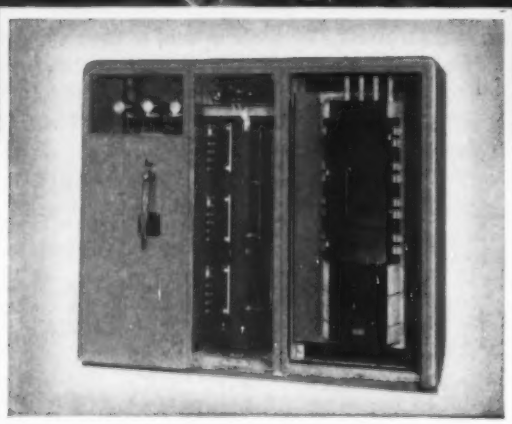
THERMOLIER UNIT HEATERS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

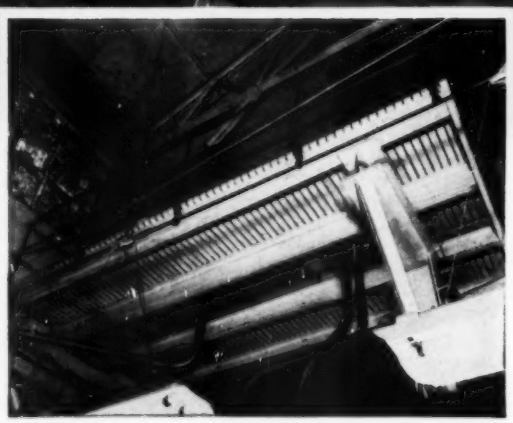
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

**For more facts circle 505 on Reply Card**

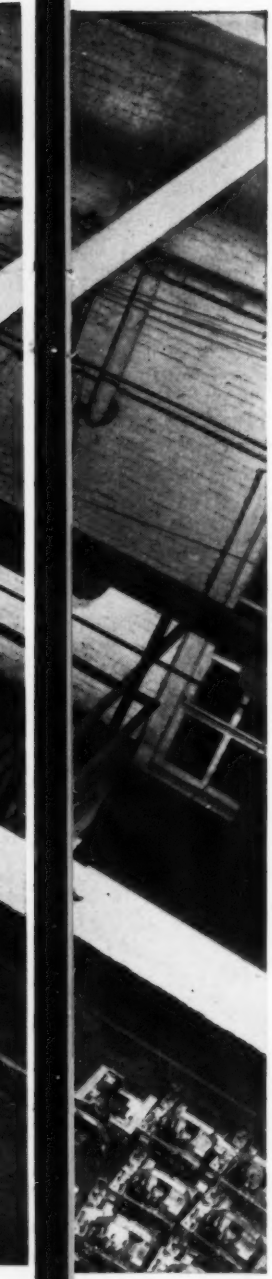




***BUILT-IN PROTECTION*** Separately mounted protective devices are eliminated. Factory-assembled Westinghouse Power Centers offer complete substation protection.



***EASY TO INSTALL*** Floor view of completely enclosed unit. Westinghouse Dry-Type Power Centers are safe . . . to hook up, simply connect high and low-voltage leads.



# How Westinghouse Power Centers release space for production

Confronted with the need to modernize his electrical distribution system, an eastern radio and electronics manufacturer installed four Westinghouse Dry-Type Power Centers on overhead platforms, releasing much needed floor space for production.

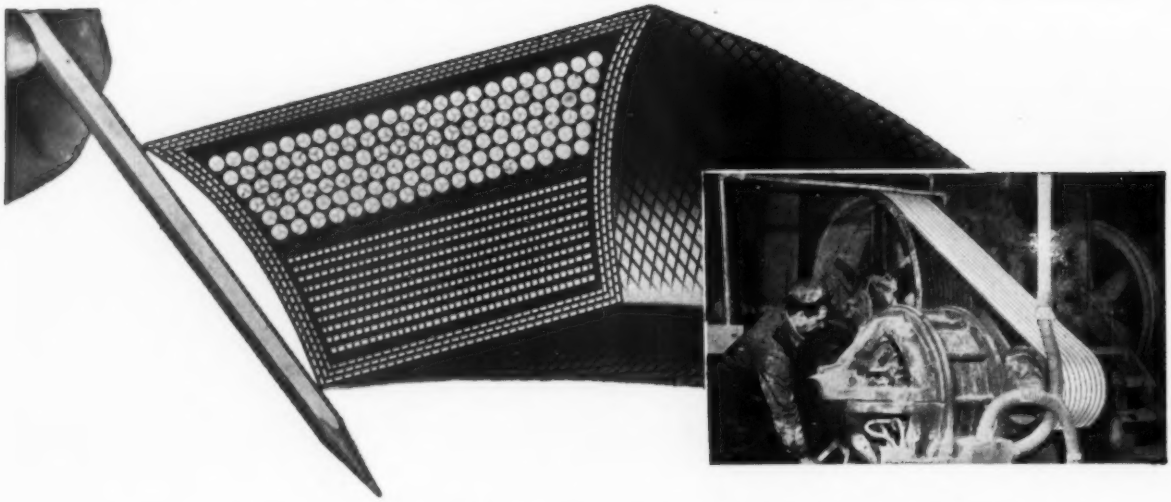
Change-over from the old system was accomplished section by section, without interrupting production. Each 300-kva integral Power Center, completely assembled, was spotted overhead, close to the center of the load it would serve. Secondary runs were thus shortened, resulting in lower line losses, better regulation, and increased productive capacity of the machinery.

As the old conventional equipment in floor-level vaults was dismantled, additional productive equipment was moved in. The entire change-over was accomplished in 60 days.

Westinghouse Dry-Type Power Centers can bring savings like this to your plant, too. With all protective equipment factory co-ordinated and assembled as a unit, they can be installed quickly and easily. Air cooled, they are safe and eliminate most maintenance headaches. For further information, contact your Westinghouse representative, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, Pennsylvania. J-70655

YOU CAN BE SURE...IF IT'S

Westinghouse

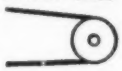


# Gates V-Belts are built with CONCAVE SIDES

(U.S. PATENT NO. 1813698)

**...that's why they last longer!**

If you want lower V-Belt costs, just make this simple test...pick up *any* V-Belt and bend it as if it were going around a pulley.



As the belt bends, grip its sides between your fingers and thumb.

If the belt has *straight sides* you feel the sides bulge out. This forces the sides of the belt to press *unevenly* against the V-pulley . . . and you get concentrated wear at the points shown by the arrows.

**Now, try this same test with the V-Belt that is built with CONCAVE SIDES** **—the Gates Vulco Rope.**

As this belt bends, you can feel the CONCAVE SIDES *fill out* and become perfectly straight.

These sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the full width of the Gates Vulco Rope and the CONCAVE SIDES therefore mean longer belt life and lower V-Belt costs for you.

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the Gates Vulco Rope!

*Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.*

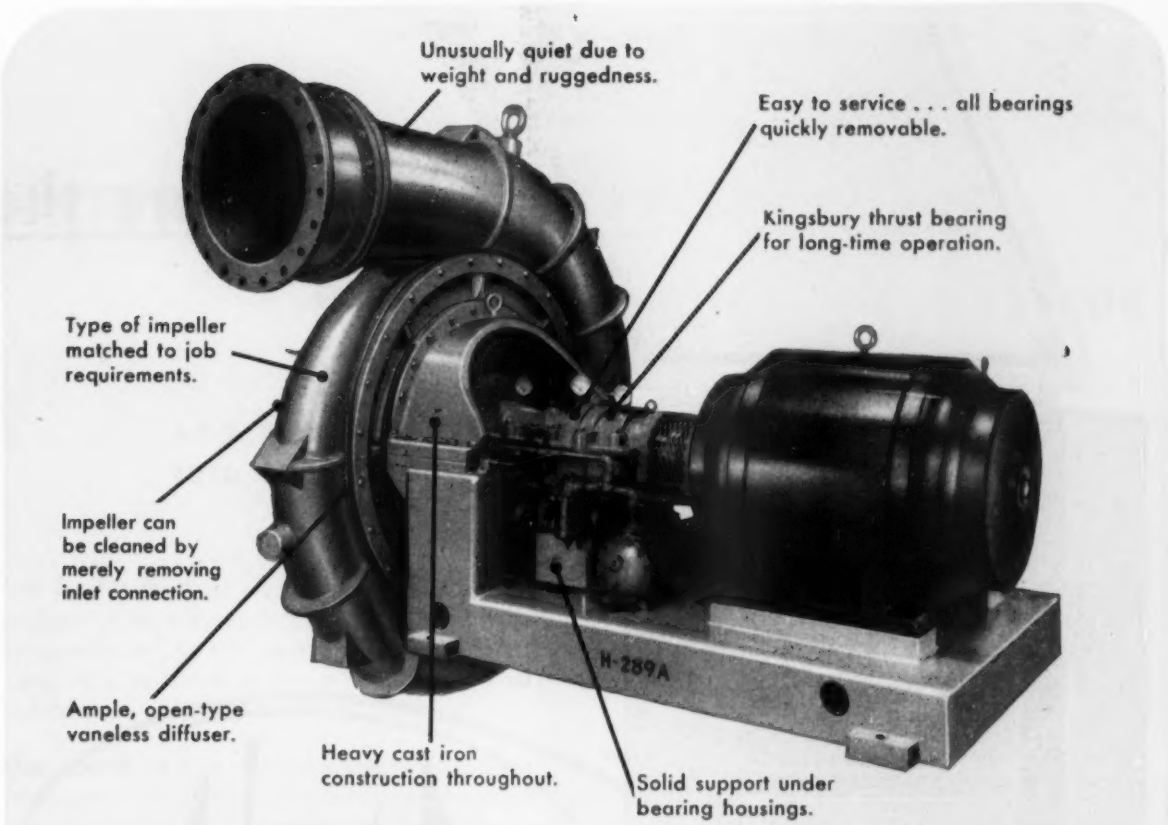
CS-535

**V-Belts — Hose Molded Rubber Goods for Industry World's Largest Maker of V-Belts**

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

**For more facts circle 507 on Reply Card**


Unusually quiet due to weight and ruggedness.
Easy to service . . . all bearings quickly removable.
Kingsbury thrust bearing for long-time operation.
Type of impeller matched to job requirements.
Impeller can be cleaned by merely removing inlet connection.
Ample, open-type vaneless diffuser.
Heavy cast iron construction throughout.
Solid support under bearing housings.
H-289A

# AIR HANDLING *Specialists* OFFER EXTRA BLOWER VALUES

These practical advantages indicate the high qualities of R-C Single-Stage Centrifugal Blowers. They enable these units to rate high in reliable performance, low operating cost, reduced maintenance and long-time satisfaction. Especially, where production depends on steady, continuous supplies of gas or air, trouble-free operation and minimum down time are imperative.

The outstanding records of R-C equipment, in these important qualities, are the results of almost a century of building air- and gas-handling equipment, exclusively. Further, only Roots-Connersville offers the *dual-ability* line of blowers, exhausters and gas pumps in both centrifugal (single and multi-stage) and rotary positive designs. This *dual choice* permits unbiased recommendations by R-C engineers, so that type, size and other characteristics can be matched to specific requirements.

For your present or future needs, in blowers, exhausters, gas or vacuum pumps, meters and inert gas generators, you will get sound counsel and competent co-operation from this organization of specialists in moving gas or air.

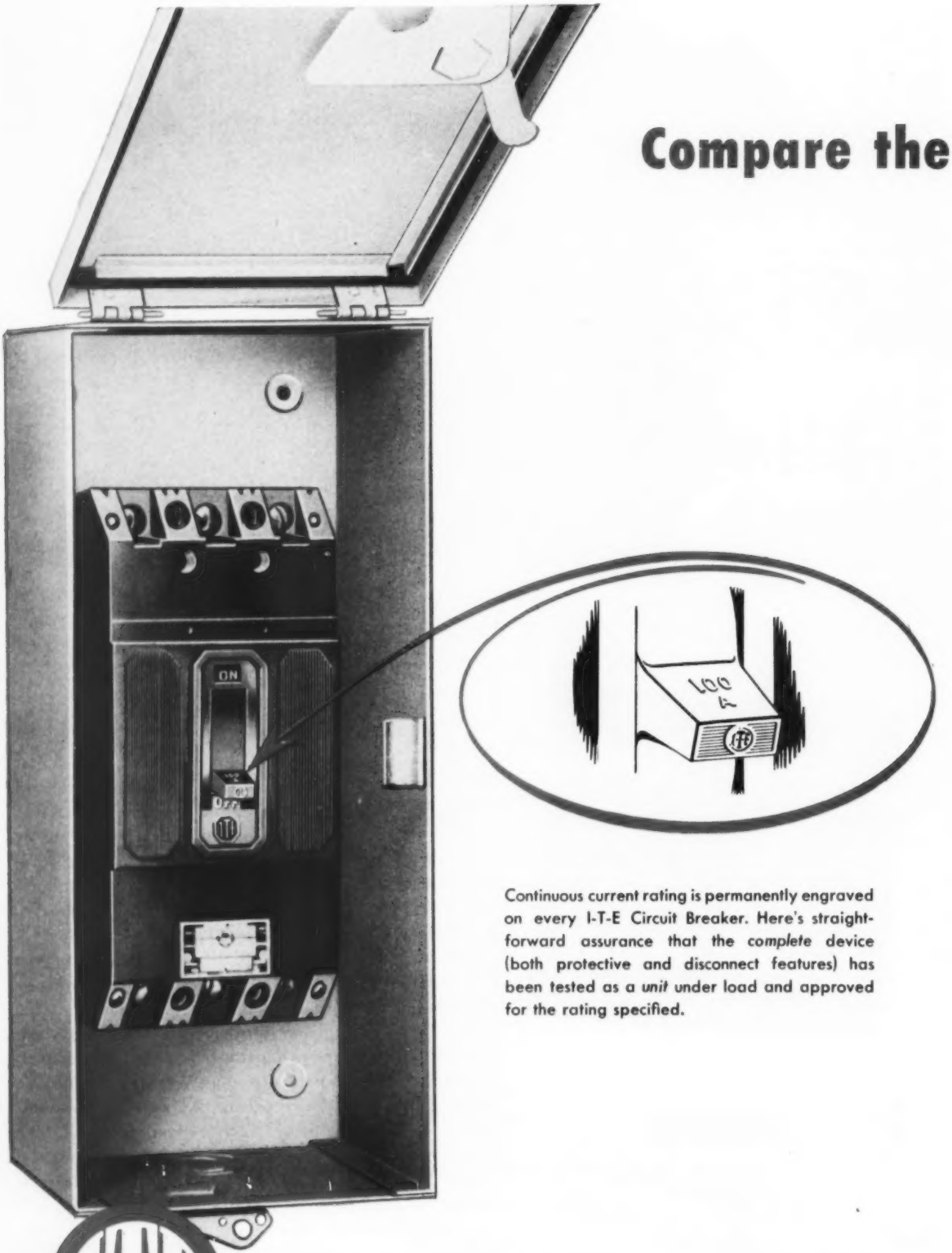
**ROOTS-CONNERSVILLE**

*Exclusive Specialists in Handling Gas and Air*

**ROOTS-CONNERSVILLE BLOWER** A DIVISION OF DRESSER INDUSTRIES, INC.
536 Planton Ave. • Connersville, Ind.

For more facts circle 508 on Reply Card

# Compare the




Continuous current rating is permanently engraved on every I-T-E Circuit Breaker. Here's straightforward assurance that the *complete* device (both protective and disconnect features) has been tested as a *unit* under load and approved for the rating specified.

# I-T-E INDIVIDUALLY-ENCLOSED

# current ratings before selecting electrical protective devices

**I-T-E CIRCUIT BREAKERS WILL SAFELY CARRY THEIR *FULL* CONTINUOUS CURRENT RATING INDEFINITELY**

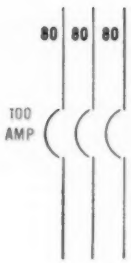
***First, bear in mind*** that every I-T-E Circuit Breaker is tested and rated as a complete *unit*. The rating prominently engraved on the breaker is the true current rating of a protective device, as well as a disconnect device.

***Then consider*** that an enclosed fusible switch is tested and rated as a *switch alone*. If tested as a unit complete with conventional fuses, it would not safely carry its full-rated current continuously. The heat generated before the fuse would blow could be terrific; the switch portion might not stand it.

***That's why*** The National Electrical Manufacturers Association recommend that "fused switches should be selected so as to have a rating at least *50 percent in excess of the load*, for *continuous duty*."

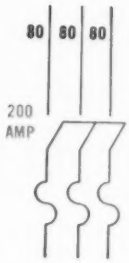
Circuit breakers, however, are taken at "face value."

***For example*** — Suppose you have the problem of providing circuit protection for a feeder supplying a continuous-load lighting panelboard. It happens you have 80 amperes traveling over each wire of a 3-phase feeder system. Selected wire size is rated 100 amperes. (The National Electrical Code says wires cannot be loaded continuously to greater than 80% for safety.)




**CIRCUIT BREAKERS**

for this job are selected simply. *Just match the circuit breaker rating to the wire size!* Install an enclosed *100-ampere* 3-pole I-T-E circuit breaker for complete protection and safety.




**ENCLOSED FUSIBLE SWITCHES**

for this job (according to NEMA) should be rated at least 50% in excess of the 80-ampere load. This means a 120 ampere current rating. In this case, it would be necessary to apply the next higher standard size—a *200-ampere* switch!

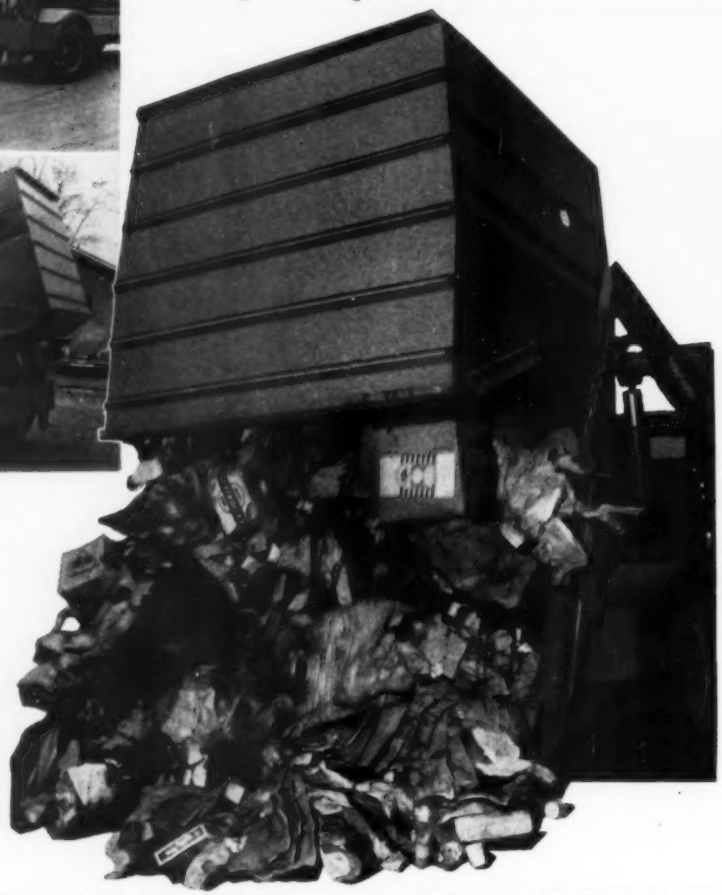
I-T-E CIRCUIT BREAKER CO. • 19th AND HAMILTON STREETS • PHILADELPHIA 30, PA.

***The I-T-E distributor nearest you carries a complete stock of I-T-E individually enclosed circuit breakers.***

# CIRCUIT BREAKERS

**For more facts circle 509 on Reply Card**

# Rubbish Disposal is only ONE of the Cost Cutting jobs for the Dempster-Dumpster in your plant...



It's amazing, almost to the point of fantasy, yet so soundly real, what the minds of men in all types of industry have cooked up for more efficiency and reduced costs with the Dempster-Dumpster.

Hundreds of plants are handling materials of practically every description with one truck-mounted Dempster-Dumpster serving scores of detachable containers. Here are just a few. Oils, gases, and liquids handled in our Tank Type Containers . . . tools and equipment in our Tool Shed Type Container . . . containers on casters placed for receiving steel chips from lathes or at conveyors for receiving finished products . . . container with doors and windows, replacing shacks for plant guards or nightwatchmen . . . containers built to handle chlorinator ash residue of approximately 1500° F. and there are dozens more.

Containers are placed wherever material accumulates. When loaded each is picked-up, hauled and emptied (as illustrated above) . . . or load set down intact. The entire operation is handled by only one man, the driver, by hydraulic controls in cab.

The containers are built in capacities up to 12 cu. yds. and each is designed to suit the materials to be handled—be they bulky, light or heavy . . . solids, liquids or dust.

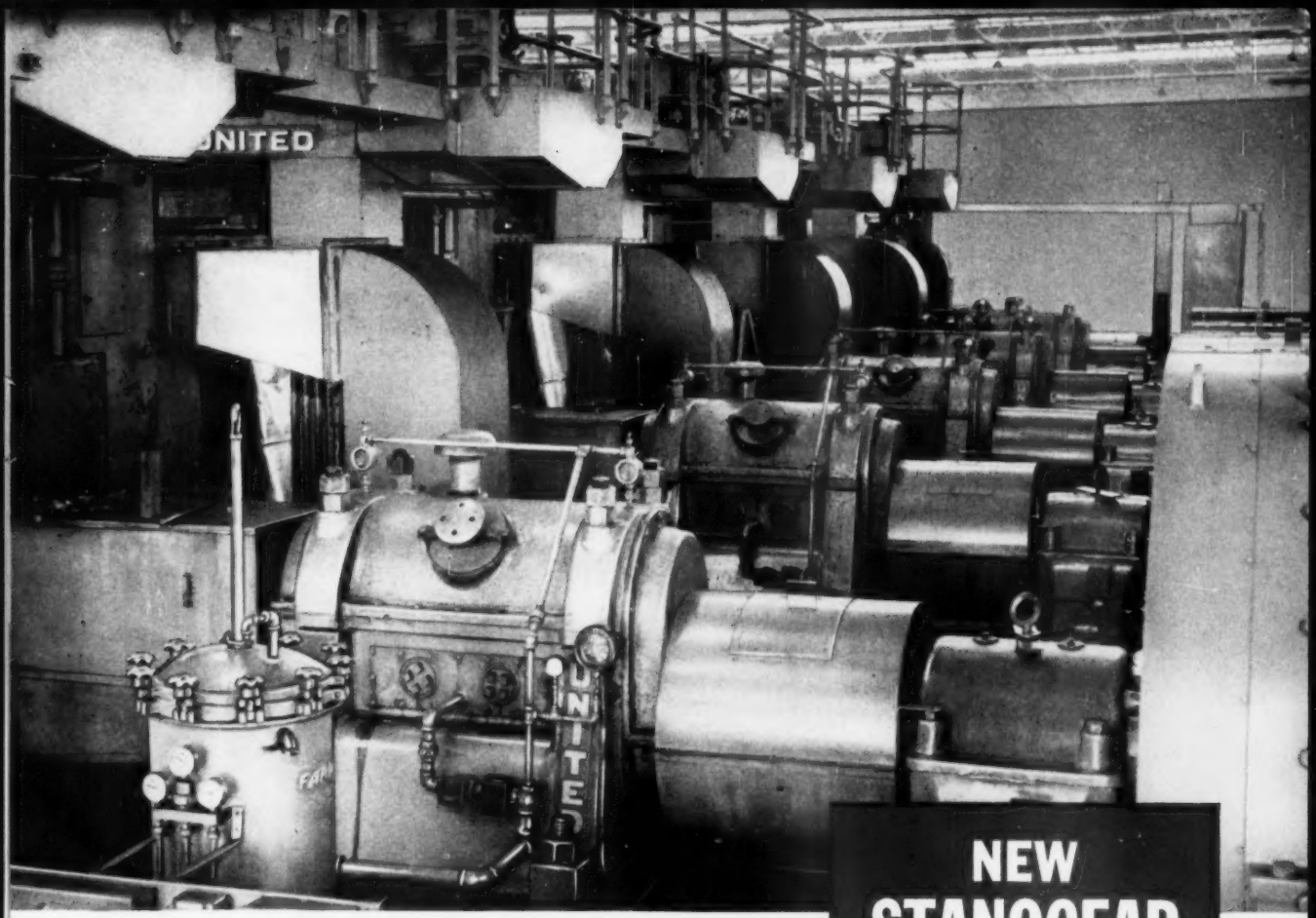
One Dempster-Dumpster, with driver, does the work of 3 to 5 conventional trucks . . . eliminates trucks and crews standing idle . . . eliminates rehandling of materials and increases efficiency and good plantkeeping.

If you have even any remote idea that this equipment could be adapted to your operation, by all means contact us because being without the Dempster-Dumpster System could easily be costing your company thousands of dollars annually. Manufactured and sold exclusively by Dempster Brothers, Inc.

One Dempster-Dumpster Handles All Containers . . . . All Sizes . . . . All Designs

**DEMPSTER BROTHERS, 163 SHEA BLDG., KNOXVILLE 17, TENNESSEE**

**For more facts circle 510 on Reply Card**




**NEW STANOGEAR** REG. U. S. PAT. OFF. **Compounds**

# NOW . . . 7 ways better for extreme-pressure lubrication . . .

New and improved STANOGEAR Compounds have been developed to meet the requirements of an increasing variety of tougher extreme-pressure lubricating jobs found throughout industry, today. The result of several years of special research and field test work, these outstanding products have proved in actual service their ability to provide these important advantages:

**1. Higher load carrying capacity.** Use of improved extreme-pressure additives in STANOGEAR Compounds provide a greater anti-weld property. This results in the higher load carrying capacity which these products have demonstrated in actual service.

**2. Superior retention of load carrying capacity.** In service tests, STANOGEAR Compounds have proved superior to conventional extreme-pressure lubricants in ability to maintain a high load carrying capacity over extended periods of service.

**3. Freedom from objectionable deposits.** Appropriate base stocks and additives give STANOGEAR Compounds a high resistance to oxidation, thus minimize the formation of deposits.

**4. Excellent storage stability.** STANOGEAR Compounds contain compounding ingredients which assure excellent stability both in service and storage.

**5. Good water separation.** STANOGEAR Compounds have demonstrated their superiority to ordinary extreme-pressure lubricants in ability to provide good water separation.

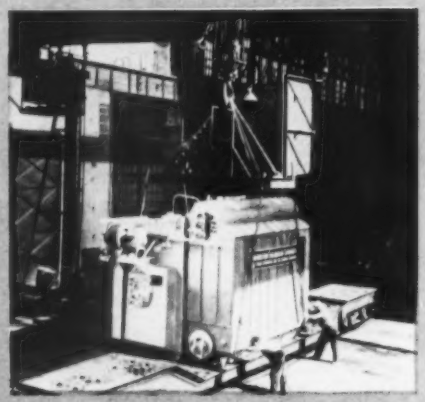
**6. Anti-foaming.** Under adverse operating conditions, the anti-foam agent in STANOGEAR Compounds has prevented foaming troubles.

**7. Versatility.** A unique combination of additives in STANOGEAR Compounds equips these products for various industrial gear applications where extreme-pressure lubricating properties are necessary. To meet varying viscosity requirements, STANOGEAR Compounds are available in eight viscosity grades.

The Standard lubrication specialist in your area of the Midwest will be glad to give you more information about the new STANOGEAR Compounds. You need only phone your local Standard Oil office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois

**STANDARD OIL COMPANY** STANDARD *(Indiana)*

# 4 reasons why... the VP Package



1 **Fully Water-Cooled Furnace** – More cooling area per cubic foot of furnace volume than any other boiler of the VP's size and type. In all but the three smallest sizes, the VP Boiler has water-cooled walls on ***all six sides*** – including the burner wall.

2 **Larger Lower Drum** – The 30 in. diameter lower drum permits a simple, symmetrical tube arrangement . . . provides easy access for washing down or inspection . . . its greater water storage capacity facilitates the handling of fluctuating loads.

3 **Centrifugal Fan** – This more efficient type of fan operates at lower speed than other types and is quiet in operation. In fact, its average noise level is less than half that of typical high-speed blowers used on most package boilers.

4 **Simple Baffle Arrangement** – Minimum changes in direction – no baffle at all in convection bank in larger VP Boilers. This means lower draft loss . . . simplified soot blowing . . . elimination of dead pockets, thus, maximum heat pick-up. In the intermediate sizes, a water-cooled baffle assures minimum maintenance.

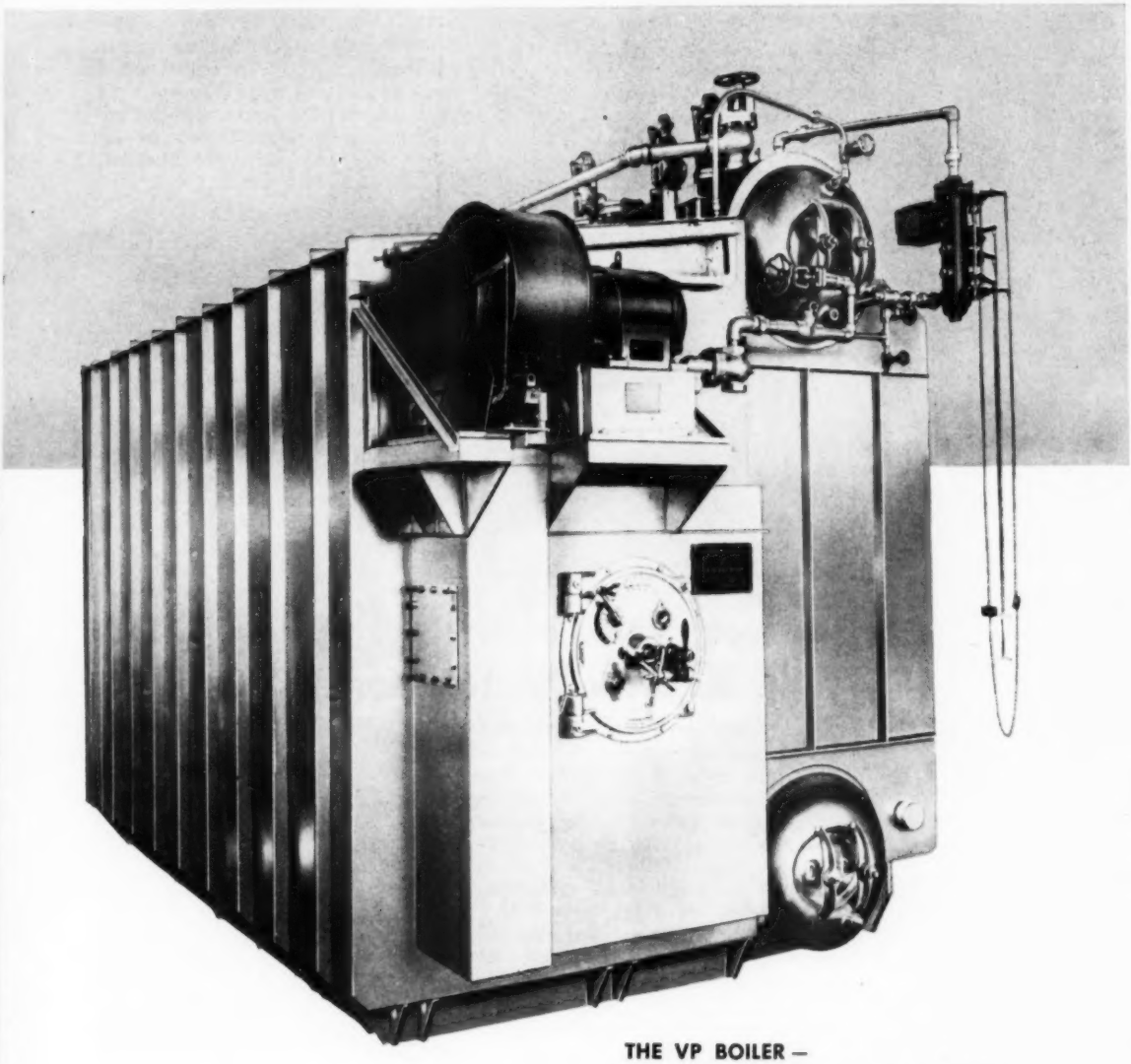
• • •

These four *extra* features are yours *only* in the VP Boiler which is designed and manufactured by Combustion – maker of many of the world's largest boilers. These units are available in capacities ranging from 4,000 to 30,000 lb of steam per hr, and pressures up to 250 psi.

Complete details on the C-E Package Boiler, Type VP, are available to you. Send for your free copy of Bulletin VP-121.

**COMBUSTION**

# is Your Best Boiler Buy



**THE VP BOILER —**
**the Package Boiler with *extra* features.**

B-666

## ENGINEERING, INC.

**200 MADISON AVENUE, NEW YORK 16, N. Y.**

**ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS**

**For more facts circle 512 on Reply Card**

# TESTING TIPS for the maintenance of plant equipment

## G-E Wattmeter Speeds Testing Without Slowing Down Production

Just hook a G-E AK-2 wattmeter around the conductor, clip the leads across the line, read power. This simple, quick operation can cut hours from your maintenance schedules without damaging conductors at all.

Costly production shutdowns while gathering power facts are not necessary—if you own an AK-2. Use on insulated as well as non-insulated conductors.

### GENUINE VERSATILITY

Its wide variety of uses will make the AK-2 one of your most valuable instruments. You can use it for trouble-shooting, motor-load tests, plant-load surveys, and many other applications.

With the G-E AK-2 hook-on wattmeter, you can get power readings from either single-phase or polyphase circuits. Vars in balanced three-phase circuits can also be measured.

### BUILT FOR ACCURACY

A dovetail joint on the magnetic jaws results in a clean, interlocking fit. This means that errors from imperfect closings are cut to a minimum.

Accuracy is further assured by the AK-2's thorough magnetic shielding, which reduces the influence of adjoining conductors to negligible quantities.

### WIDE RANGE

The G-E AK-2 hook-on wattmeter will measure from 3 to 300 kw on ranges of 15–600 amperes, and 100–600 volts. Price is $95.53.* For additional details, write for bulletin GEC-951.

*Manufacturer's suggested retail price.

## Get Dependable Temperature Measurements with a G-E Dual-range Hand Pyrometer

Here is an instrument as rugged as any shop tool—the FH-1 hand pyrometer. Yet, you can depend on its accuracy in reading after reading—whether you're measuring the temperature of surfaces, liquids, gas or molten metals.

Automatic cold-junction compensation prevents any distortion of the reading from changes in the ambient temperature surrounding the instrument. This feature even compensates for the temperature of the instrument itself.

### DUAL RANGE SAVES MONEY

This single unit offers two ranges—0–500 F and 0–1500 F. Besides eliminating the need for buying several single-range pyrometers, the FH-1 cuts hours off testing time. The operator carries only one instrument. Furthermore, he can switch from one range to the other with a simple flick of the thumb.

### THREE INTERCHANGEABLE TIPS

A surface tip, an immersion tip for liquids and molten metals, and a two-prong contact are available for the FH-1. Also available are a carrying case, and both flexible and rigid extension arms. Both tips and arms can be changed in a matter of seconds without recalibration or further adjustment.

### MORE INFORMATION AVAILABLE

The G-E FH-1 hand pyrometer can help you to eliminate waste resulting from wrong temperature guesses. Write for bulletin GEC-836. Price, including all three tips, both extension arms, and the carrying case, is $191.20.*

## Hook-on Volt-ammeter Offers 8 Ranges; Will Measure Motor-starting Currents

Eight easily read scales make the G-E AK-1A hook-on volt-ammeter suitable for a wide range of applications. This versatile instrument offers five current scales—one from 0 to 7.5 amps, to read those low-amp circuits, and four others all the way up to 750 amps. Three voltage scales are provided—from 0 to 150, 300, and 750 volts.

The AK-1A offers value beyond that of an ordinary volt-ammeter by indicating motor-starting currents. A simple screw adjustment of the pointer-stop mechanism gives you this reading.

### STURDY, SAFE CONSTRUCTION

A strong Textolite† case enables the AK-1A to stand up against unusual service abuses without cracking or chipping.

Complete insulation, together with the one-hand, hook-on operation means maximum safety to the user. Low price is $66.74.* Send for bulletin GEC-901.

†Reg. trade-mark of General Electric Company

When ordering bulletin, write to Section 602-262, General Electric Company, Schenectady, N. Y.

**BUY NOW**

***From Your Nearest G-E Distributor***

**GENERAL ELECTRIC**

**For more facts circle 513 on Reply Card**

*Remember* the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

# *Engineered* for tough service

THIS TUBE-TURN Welding Neck Flange will contain greater pressures under temperature extremes, and will last longer than other types under repeated bending or vibrations of piping. It is *engineered* for tough service . . . with a long, tapered hub, and a smooth transition in thickness to the pipe-end bevel.

You can select the exact Welding Flanges you require from TUBE TURN's complete line: welding neck; slip-on; lap joint; socket welding; blind; orifice; or pipeline non-standard flanges. It *pays to specify* TUBE-TURN Welding Fittings and Flanges. Call your nearby TUBE TURNS' Distributor . . . you'll find one in every principal city.

Be sure you see the double "tt"

**TUBE TURNS, INC.** LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles • Denver • Atlanta

Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

ENGINEERING SERVICE

# TUBE TURNS' *Engineering Service* HELPS DEVELOP NEW PIPING TECHNIQUE

D. R. Cheyney, of TUBE TURNS' Engineering Service Division, has had wide experience in alloy and non-ferrous applications.

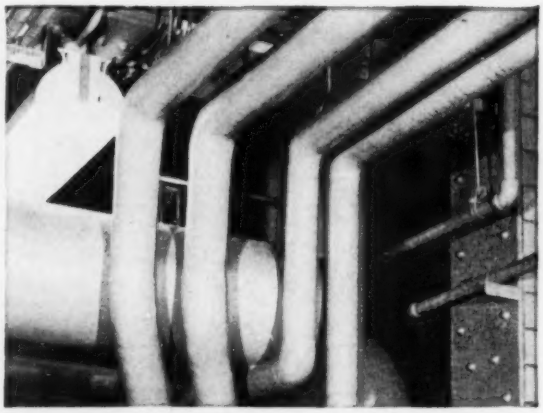
THIS STORY of how a large processor saved $50,000 and conserved scarce copper with a new approach to a piping application shows why TUBE TURNS, INC. is so highly regarded as an authority on piping engineering.

The problem involved the retubing of seven cooling units, formerly fabricated from copper tubing and fittings. Aluminum was considered as a replacement; however, there were no satisfactory methods for welding thin-walled aluminum tubing to welding fittings. TUBE TURNS' Engineering Service Division, working with Alcoa, came up with the solution. A new brazing technique was developed, and special TUBE-TURN Welding Returns, and TUBE-TURN Welding Elbows were supplied.

TUBE TURNS' Engineering Service is ready to help *you* in such special applications.

**TUBE-TURN aluminum long-radius Welding Returns being brazed to aluminum tubing, in fabrication of cooling coils.**

**SPEEDS FABRICATION**—TUBE-TURN Welding Fittings have won a reputation for dimensional accuracy that pays off in fast, easy alignment and fabrication. Time often is saved by welding assemblies in the shop, quickly tying them into the job.



**SPACE SAVER**—Welded piping makes a compact, neat installation—and requires no maintenance. Streamlined, its insulation is more easily applied.

**Want Dimension Data?**

TUBE TURNS, Inc., has compiled a handy folder of charts covering dimensions and weights of TUBE-TURN Welding Fittings and Flanges. If you'd like a free copy just send this coupon.

TUBE TURNS, INC., Dept. D-6
224 East Broadway, Louisville 1, Kentucky

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"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

## TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

# HALL INDUSTRIAL WATER REPORT

*Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.*

Volume 1 | JUNE 1953 | Number 3


## *Boiler Scale Formation And Control Subject Of Paper by Rivers*

In a recent paper, "Concentrating Films: Their Role in Boiler Scale and Corrosion Problems," H. M. Rivers, Director of Engineering Service for Hall Laboratories, discusses the theory of how and why highly concentrated films form on steaming surfaces, the mechanism of steam generation and scale formation, characteristic effects of concentrating films, and problems associated with degree of film concentration.

Mr. Rivers points out that water consultants are responsible for treating boiler water so that concentrating salts do not crystallize out of solution, or precipitate in forms which will accumulate continuously as solid deposits. Further responsibility: natural constituents or added chemicals in boiler water must not give trouble because of decomposition or volatilization under "film" conditions; and corrosive concentrations of free caustic must be safely avoided.

On the other hand, boiler makers must design for heat input rates which limit tendency toward excessive concentrations, and provide adequate circulation and turbulence to assure rinsing of all steaming surfaces.

Write for your free copy of this informative paper.

## *Radar Plots Course Of Illinois' Water*

The greatest water resource of the State of Illinois lies in the air moving across it, Dr. A. M. Buswell, chief of Illinois State Water Survey, reported at the recent American Power Conference.

Radar tracks the release of this water to land surface as rain from thunderstorms. Not only are storm paths logged, but the amount of rainfall can be estimated.

Accumulation of such data provides a basis for future efforts to trap more rain.

# CONSULT WATER SPECIALISTS BEFORE BUILDING!

### *Future Water Problems are solved in planning stage*

Calling in the specialists of Hall Laboratories before a plant is built can save many dollars and much time. Hall engineers study plant requirements and needs, and come up with important recommendations which can then be incorporated in the plant as it is built.

Consider a recent instance. Hall was called in by the consulting engineers of a large, New York State manufacturing company that had decided to construct a plant in California. The problem involved was the proper treatment of the local city water supply, for use in boilers at the new plant. Changes in the available water would occur frequently due to the mixture in the system of water from four different sources, all varying widely in composition. These changes could markedly alter the composition of the plant's water supply within less than an hour's time.

To properly prepare this water, a flexible pre-treating system was recommended by Alex Henricks and approved by his associates on the Hall headquarters staff. Designed to insure good quality water under any conditions, the equipment suggested was simple to operate and sized so that capacity would be adequate regardless of incoming water composition; yet frequent attention would not be required to keep the system in proper operation.

## *Industrial Water Problems Require Special Handling*

There are no "stock answers" to industrial water problems. For information write, wire or call Hall Laboratories, Inc., P.O. Box 1346, Pittsburgh 30, Pa.

*Water is your industry's most important raw material. Don't waste it.*

## *Water Important Topic Of ASME Meeting in L. A.*

Major interest appears to focus on three papers dealing with corrosion produced by condensed steam, but other water problems are not neglected at the two sessions sponsored by the Joint Research Committee on Boiler Feedwater Studies and the Power Division at the mid-year meeting of the American Society of Mechanical Engineers at Los Angeles, June 29 to July 3.

## *Woolen Yarn Dyer Improves Cleaning, Dyeing Operations With Hall Technique*

Unsatisfactory yarn scouring, plus the intermittent need for 35% more acid in dyeing operations than tests indicated should be needed, plagued this yarn dyeing concern, a new client of Hall Laboratories.

Noting that dye kettles were heated with direct-contact steam from a low-pressure boiler, the Hall engineer checked steam for carryover of alkaline boiler water. At peak load, samples were heavily contaminated; even at normal load, carryover was appreciable.

The Hall engineer recommended using Hagan Anti-Foam to reduce steam contamination. Now, even for heaviest loads, steam contains less than 3 ppm dissolved solids, higher boiler water solids are carried with resulting savings in water, heat, chemicals.

LUBRIPLATE No 630-AA IS PRACTICALLY A UNIVERSAL LUBRICANT

—says

THE SPOKANE PORTLAND CEMENT CO.

"With the introduction of LUBRIPLATE No. 630-AA, we were able to satisfy all our needs for solid type lubricants with only two LUBRIPLATE Products. LUBRIPLATE No. 630-AA might almost be considered a universal lubricant. Furthermore, it has effected marked savings in both lubricants and labor!"

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

**REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.**

For more facts circle 516 on Reply Card


# BACKTALK ABOUT PAST ISSUES

## Plant Engineering Course

PLANT ENGINEERING:

"I was very glad to see the article in the March issue regarding the Plant Engineering course at Milwaukee School of Engineering. It sounds very interesting and I hope it meets with success. If possible, I would like to have six reprints of this article.

"Incidentally, the footnote is in error. It refers to California State Polytechnic College as 'California Institute of Technology.' There is a big difference between the two schools and no connection between them.

"I was able to attend one dinner meeting of the San Francisco Plant Engineers' Club this year with a few students. It was an excellent meeting.

"You might be interested in knowing that I use many of the articles in PLANT ENGINEERING for our Plant Engineering course, since I have not been able to find a textbook on plant engineering." *T. Hardgrove, California State Polytechnic College, San Luis Obispo, California.*

## Request Picture of Marion Plant Engineers' Club

PLANT ENGINEERING:

"We would like to use the picture you carried in the December, 1952, issue, showing the inaugural meeting of the Plant Engineers' Club of Marion, Indiana. The picture will be used in *I & M News*, our employee newspaper." *I. H. McKathnie, Editor, Indiana and Michigan Electric Co., Fort Wayne, Indiana*

## Trouble Tracing Lost Tubes

PLANT ENGINEERING:

"We are experiencing difficulty locating lost tubes between stations in our pneumatic tube mailing system. An article entitled 'Radioactive Tracers Aid in Plant Communications,' on page 102 of the April issue, describes a method of locating lost tubes by means of a Geiger counter and radioactive cobalt.

"Please forward information relative to the availability and sources of supply of this type of equipment.

"We are also interested in obtaining information regarding Zeprex, which was also described in the above issue." *R. M. Soli, Purchasing Department, Ladish Co., Cudahy, Wisconsin.*

**Editor's Note:** Both the Geiger counter and radioactive cobalt are available at one source of supply here in Chicago. Information about this equipment may be obtained by writing to Mr. R. D. Piper, Assistant Sales Manager, Nuclear Instrument and Chemical Corp., 225 W. Erie St., Chicago, Illinois.

## Steel Primer Gets 10 Votes

PLANT ENGINEERING:

"We wish to obtain 10 copies of the article which appeared in the February, 1953 issue. This article starts on page 87 and is entitled, 'Plant Engineers' Primer for Selection of Stee's.'

"We would appreciate your sending these tear sheets to the attention of R. H. Menning, Purchasing Department." *L. C. Stilp, General Purchasing Agent, Kimberly-Clark Corp., Neenah, Wisconsin.*

## Comments on Lighting Series

PLANT ENGINEERING:

"We have noted with interest your offer of a comp'ete set of reprints on the series of articles concerning lighting. It will be appreciated very much if we could receive these reprints.

"May we take this opportunity to thank you for all the valuable information always contained in each issue of your publication." *A. T. Parker, Chief Engineer, Stoddard Aircraft Radio Co., Inc., Hollywood, California.*

PLANT ENGINEERING:

"Please send us a copy of your reprint covering the complete series of articles on lighting.

"These have been very helpful and especially timely for us—you are to be congratulated for their publication." *H. C. Whitmarsh, Kinkead Industries, Inc., Chicago, Illinois.*

## Query on Mud-Jack Article

PLANT ENGINEERING:

"Would you please give us more information on the use of the mud-jack method reported in the March, 1953 issue. We wou'd like to have answers to the following questions:

"The manufacturer of the equipment.

"By top soil do you mean loam or is any clay soil satisfactory?

"What is the ratio of top soil to cement?

"How far apart are the holes made in the floor?

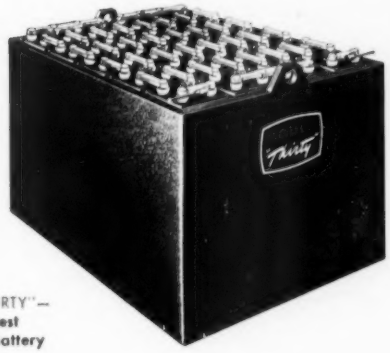
"Your answers to these questions and any other pertinent information

## PROTECTION

### Against Downtime . . .

# THANKS TO BATTERY POWER!

Battery power is the most dependable industrial truck power available today! With a minimum of moving parts, battery trucks work longer, last longer, chalk up in-service records no other type of truck can approach. Such dependability . . . such freedom from downtime . . . means maximum materials handling economy. Protect *yourself* against expensive downtime with Gould-battery-powered industrial trucks.



Specify
THE GOULD "THIRTY"—
**America's Finest**
**Industrial Truck Battery**

## GOULD *INDUSTRIAL BATTERIES*

**GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.**

*Always Use Gould-National Automobile and Truck Batteries*

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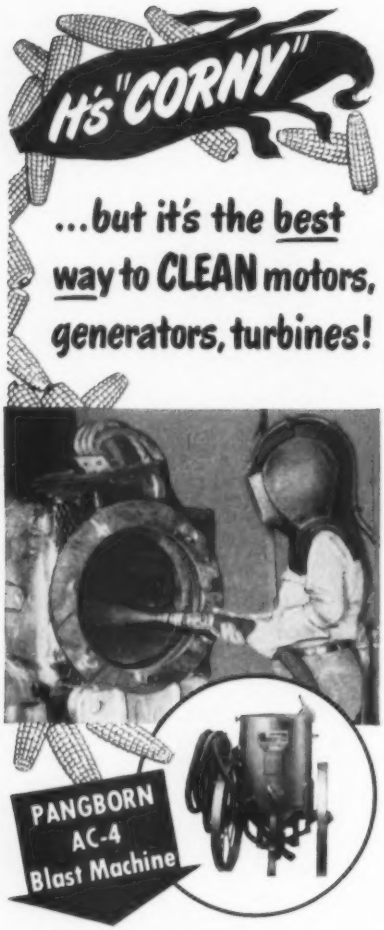
**For more facts circle 517 on Reply Card**




- CUTS DOWN-TIME
- CLEANS WITHOUT SOLVENTS
- ELIMINATES DRYING
- ELIMINATES TOXIC AND EXPLOSIVE DANGERS

THE new Pangborn AC-4 Blast Machine cleans motors, generators and turbines faster . . . cleaner . . . and lets you use them sooner because there's no waiting for parts to dry. In fact, dangerous solvents that can lead to explosions, caustic action, and toxic poisoning are completely eliminated!

The AC-4 uses soft, 20-mesh corncob grits to rapidly remove dirt, grease, old paint, etc., in one-third the time, and at 90% less cost than old-fashioned methods. GET FULL DETAILS . . . write, telling us what you clean, to: PANGBORN CORP., 3200 Pangborn Boulevard, Hagerstown, Md.

*Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment*

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

For more facts circle 518 on Reply Card




# BACK TALK

will be appreciated." *A. W. McKenna, Pullman-Standard Car Mfg. Co., Worcester, Massachusetts.*

**And the Reply:**

"Western Electric Co. purchased the mud-jack equipment from the Hillsman Equipment Co., 2000 N. Hawthorne, Melrose Park, Illinois.

"As we understand it, there are no specifications for the kind of top soil that is to be used. The mixture that we used was 80 per cent top soil and 20 per cent cement and water. The mix should have the consistency of thick cream. The amount of water would be determined by the amount of water in the top soil.

"The distance between holes will vary with the size of the slab and the amount of the depressed area. Normally, this distance should not be greater than two feet. However, we drilled ours about three feet apart." *A. G. Benedix, Editor, The Microphone, Western Electric Co., Chicago.*

## Research on Industrial Noises

PLANT ENGINEERING:

"I am currently doing research for a report on 'The Effects of Noise on Industrial Workers.'

"During the latter half of last year PLANT ENGINEERING had an article on this very subject. I would appreciate receiving a tear sheet of this article." *Richard Maynard, Bronx, N. Y.*

**Editor's Note:** The article referred to is "Less Noise Means More Production," which appeared in the September, 1952 issue, page 73.

## Pre-Cast Construction Query

PLANT ENGINEERING:

"In looking over the January, 1953 issue, I read the article 'Pre-Cast Wall Construction Cuts Industrial Building Costs.' We are very interested in this subject at this time.

"I would like to get more information as to the forms used in the pre-cast walls and columns. Any information that is available which you could send to us would be greatly appreciated." *P. H. Legendre, Engineer, Jefferson Lake Sulphur Co., Brazoria, Texas.*

## Interested in Zeprex

PLANT ENGINEERING:

"We are particularly interested in this material as roof slabs, and would appreciate complete information on the product." *E. G. Fliss, Buyer, J. I. Case Co., Racine, Wisconsin.*

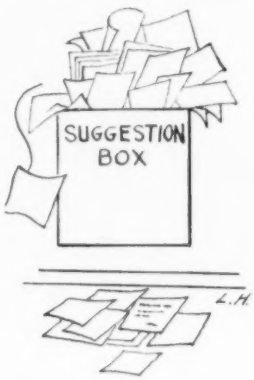
PLANT ENGINEERING:

"In a recent issue, we noticed an article for material bearing the trade name Zeprex, and the illustration and copy indicated that it was adaptable to residential and industrial construction.

"We are wondering if this material in thinner boards or slats has any attraction for use to the manufacturer of furniture or cabinetry.

"We would be pleased to have the full information, including prices, if possible, on this material for consideration and future reference." *R. E. Wasmuth, Factory Service Manager, Kitchen Maid Corp., Andrews, Ind.*

**Editor's Note:** This product is being manufactured by U. S. Plywood Corp., 55 W. 44th St., New York, N. Y.




## Out of Stock But Still Getting Requests

PLANT ENGINEERING:

"An article in the November, 1952 issue titled 'Dictaphone's Parking Lot,' refers to an article in the July, 1951 issue 'Parking Lot Layout is Planned to Handle Large Volume of Cars,' by Mr. J. McCabe.

"We are very much interested in reading Mr. McCabe's article, but we have not been successful in locating a copy of that particular issue within our plant.

"We would appreciate any efforts extended to have a copy of this article forwarded to us as soon as possible." *W. F. Koester, Manager, Plant Engineering Department, Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin.*

## Request Reprints of Plant Engineering Curriculum

PLANT ENGINEERING:

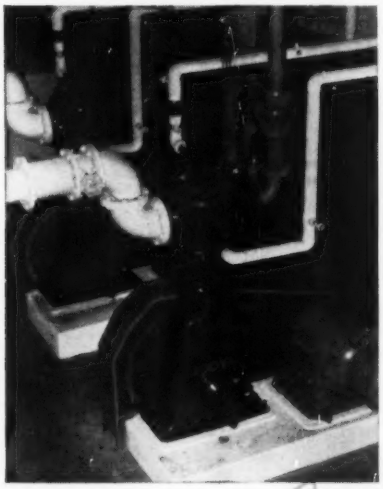
"Thank you for the copies of the March, 1953, issue, which contain the Plant Engineering curriculum story of the Milwaukee School of Engineering. It tells the story of our new curriculum very concisely and explains the concentric curriculum well.

"Mr. Werwath was very pleased with the article and would like reprints if it is possible to obtain them. What would be the cost for lots of 1000, 5000 and 10,000?" *Ralph B. Malsom, Staff Editor, Milwaukee School of Engineering. Milwaukee, Wisc.*

# It's JOY for OIL-FREE AIR

*Above: Joy WNO-112 Oil-Free Compressor*

*Below: Joy WGO-9 Oil-Free Vertical Compressor*



## Backed by manufacturing experience since 1915

★ Special lightweight pistons minimize wearing pressure on the rings.

★ Ease of disassembly facilitates inspection of pistons, rings, cylinder liners and valves.

★ On-the-job-replaceable chrome-plated cylinder liners for hard, smooth, friction-reducing surfaces. Also replaceable crosshead guides.

★ Carbon graphite compression rings designed to compensate automatically for wear.

★ Large, direct air passages and liberal water-jacketing reduce heat of compression and increase ring life.

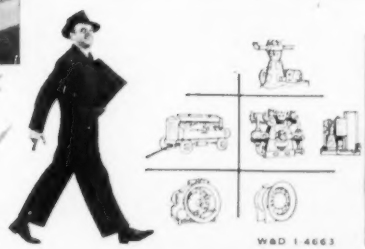
★ Patented Dual-Cushion valves, all parts of which are made from corrosion-resistant materials.

★ All wearing areas, except carbon rings, are either chrome-plated, surface hardened, or of stainless steel.

★ Complete line of types and sizes of compressors to meet *any* capacity and pressure requirements. ● Let us quote on your air supply needs of any nature. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

*Consult a Joy Engineer*

for Vaneaxial Fans . . . Compressors, Vacuum Pumps and Boosters . . . Oxygen Generators



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**JOY**

**SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885**

**For more facts circle 519 on Reply Card**

# —and now TAPER-LOCK

*There's only*
*ONE*
**TAPER-LOCK**

FROM the package to the shaft — ready, *immediately,* for the job! This is the new "off-the-shelf" availability which Dodge brings to roller chain drives. And, with this new availability, you get the important advantages of the famous Taper-Lock principle, proved in millions of V-belt installations.

No more costly and time-consuming boring of sprockets to fit your shafts! *Taper-Lock bushings are available in a range of sizes for the great majority of industrial applications.* And it's not necessary that shafts be turned and ground to get a tight fit. *Taper-Lock not only is keyed to the shaft, but grips it with the firmness of a shrunk-on fit.* Yet when a sprocket is to be replaced, it comes off easily, quickly. The bushing may be re-used.

Taper-Lock sprockets are compact. They have no flange, and no protruding parts. Taper-Lock occupies no more space on the shaft than standard sprockets. The flush design means safety.

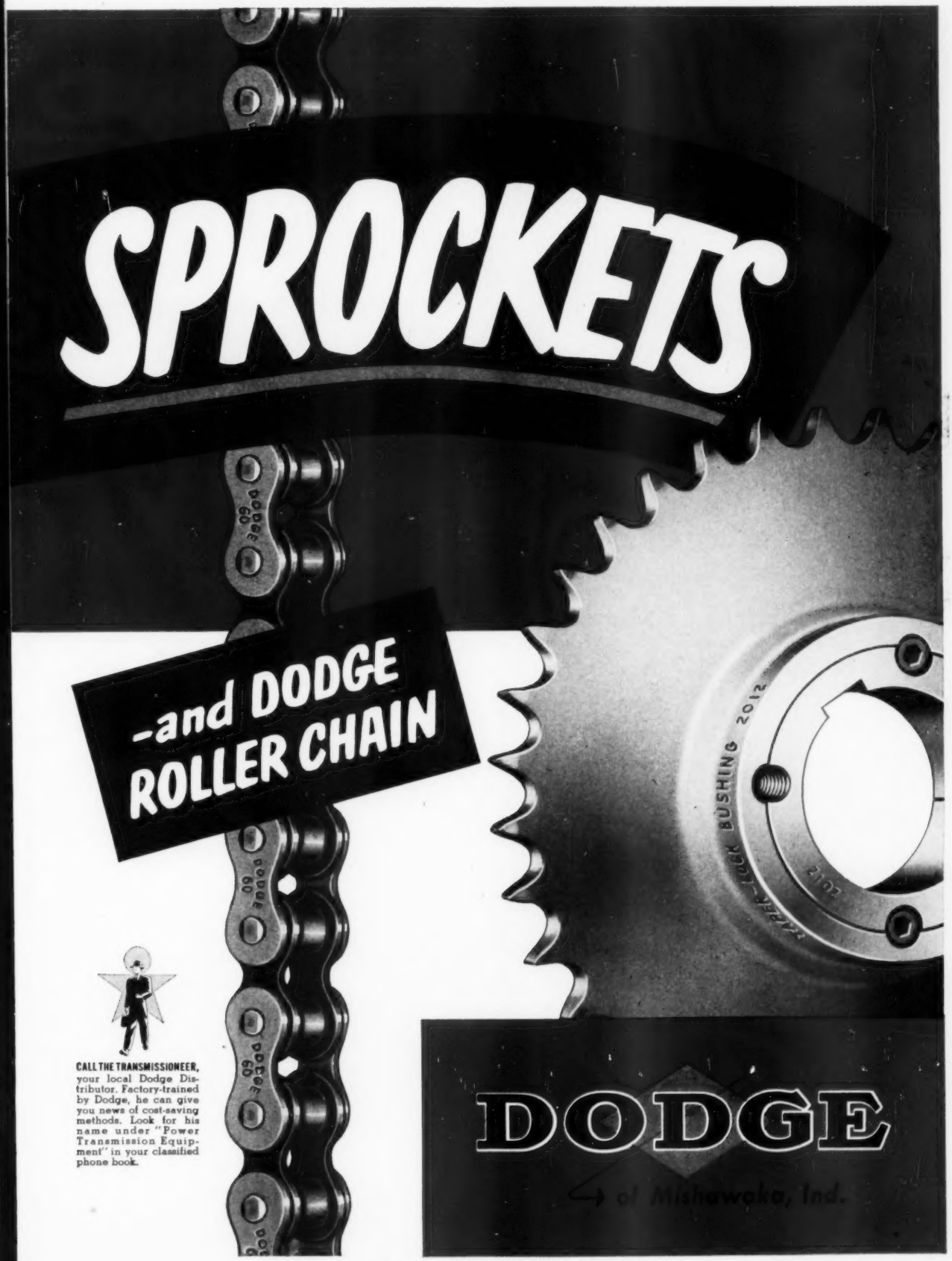
The new Dodge line of roller chain is made to highest quality standards, by craftsmen who know chain manufacture. Both chain and sprockets are made to ASA standards. Taper-Lock sprockets will take any make of American standard chain.

Taper-Lock sprockets will be carried in Distributors' stocks for immediate delivery, in a complete range of B-type steel sprockets—½" to 1¼" pitch. The range in ⅝" pitch, for example, is 12 to 112 teeth.

All bushings and the smaller sizes of sprockets are packaged individually. Dodge roller chain is packaged in 10-foot lengths — and can be furnished in 50-foot and 100-foot reels.

For detailed information about Taper-Lock sprockets and Dodge chain drives write now for Bulletin A-624.

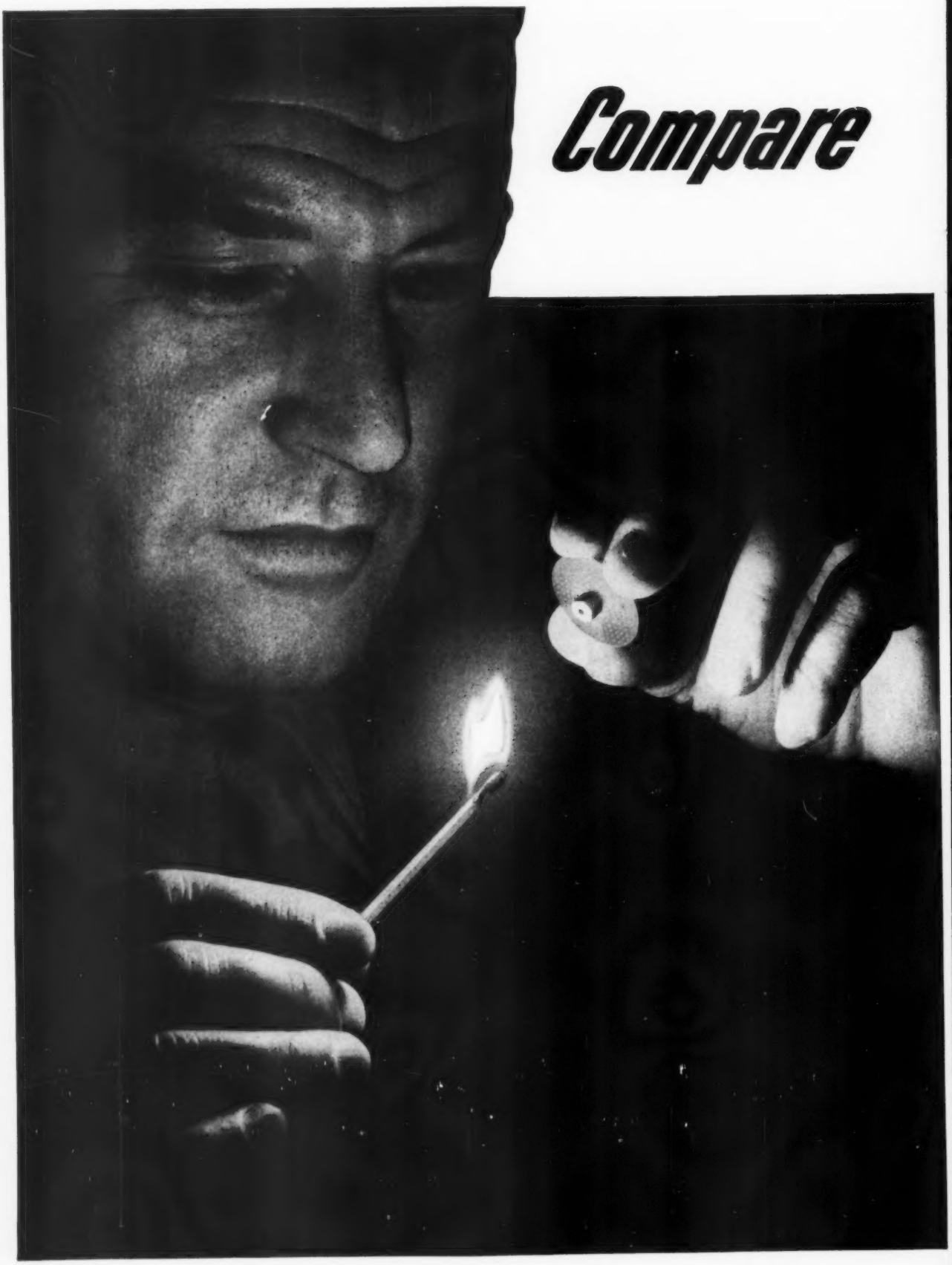
**DODGE MANUFACTURING CORPORATION, 2700 Union St., Mishawaka, Indiana**






**CALL THE TRANSMISSIONEER,** your local Dodge Distributor. Factory-trained by Dodge, he can give you news of cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

For more facts circle 520 on Reply Card


Compare

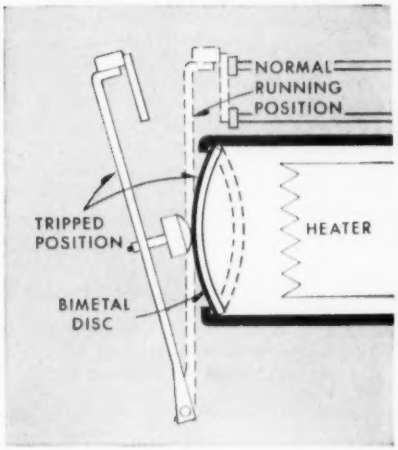
# *Life-Line* starters by this simple demonstration

### Proof that Life-Line Starters give you instant, positive motor protection

See this flame test. When heated and placed upon a flat surface, this bi-metal disc will snap up into the air. Here is simple action—demonstrated right before your eyes—powerful, positive action to protect your motors from the destroying heat of dangerous overload.

The bi-metal disc is the nerve center of the overload relay designed into every Westinghouse Life-Line Starter. The disc accurately stands watch over the build-up of motor heat, because a motor can become overloaded. At precisely the right instant, just before a motor may be dangerously overloaded, the disc snaps, as in the flame test. This causes starter contacts to open lightning fast, protecting your valuable motor.

Only Westinghouse Life-Line Starters have the bimetallic, snap-action, disc-type overload relay . . . the most precise motor protective device you can buy. But, just as important, the bi-metal maintains its precision calibration for the life of the starter. It will not fail because it cannot fatigue, age or oxidize. Premature, or "hot" resets can ruin other types of overload relays, such as the solder- pot. Remember—the price of poor protection is smoldering, useless motors, costly motor rewind jobs, other damaged equipment, down time and expensive production pile-ups.




Westinghouse bi-metal principle of overload relay protection, dependable for the full life of the installation.

### Proof that Life-Line Starters are tough, maintenance free

Simplicity of design, fewer and more rugged components, only one moving element . . . all spell toughness and long life in Westinghouse Life-Line Starters. Parts that aren't there, can't wear.

Call your Westinghouse Representative to see the flame test. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30146

YOU CAN BE SURE... IF IT'S **Westinghouse**

For more facts circle 521 on Reply Card

# PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

*Edited by E. B. Skubik*

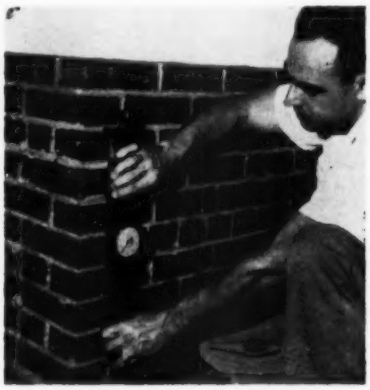
## Masonry Failures Analyzed

FREE MAGNESIUM oxide has been blamed by the National Bureau of Standards as a cause of cracking in masonry. Present in large amounts in normal hydrated dolomitic (magnesian) limes and in some masonry cements, the magnesium oxide gradually combines with moisture, expanding and causing failures in the masonry.

Two experimental brick walls were constructed at the National Bureau of Standards exposure site. Mortars used were mixtures of portland cement and sand to which were added dolomitic hydrated limes containing high percentages of unhydrated magnesium oxide. A pair of metal plugs was embedded in the face of each wall with a vertical separation of 20 inches. Changes in distance between the small holes at the centers of each pair of plugs were measured with a Whittemore strain gage at intervals over a period of two years.

All of the wall faces expanded substantially, roughly five to 10 times the expansion shown by comparison with an experimental wall in which the cement-lime mortar was made with high calcium hydrated lime. The percentage increase in height appeared to depend upon the proportion of lime in the mortar and whether the lime was dolomitic finishing hydrate or dolomitic masons' hydrate.

Several recommendations for preventing and remedying masonry failures caused by this type of delayed expansion are given. First, mortars should be made only from those masonry cements and cement-lime mixtures whose linear expansions do not exceed one per cent when tested by ASTM methods. Second, in the absence of tests, only Type S (special) hydrated lime or putty made from high-calcium quicklime, should be used. Such putty should be soaked for not less than 24 hr. Third, when failures develop from use of insufficiently hydrated materials, repairs should be delayed, if possible, until hydration of free oxide has approached completion. *From Summary Technical Report 1740, published by the National Bureau of Standards, Washington, D.C.*



**Vertical expansion in an experimental brick wall at NBS exposure site is measured with Whittemore strain gage**

## Offices Take to the Air, Penthouse Style, to Save Space

PRODUCTION expansion created a big space problem in plant 3 of Allison Div. of General Motors in Indianapolis, Indiana. Offices were moved to the basement level to gain room for machines and tools.

This location, however, put manufacturing supervision at an inconvenient distance from production problems. In the way of a solution to this problem, one man suggested the idea of overhead offices.

Machine placements prevented the double use of much of the floor space. Inspection stations, wash rooms, tool storage areas were considered good spots for the offices.

The original installation was designed by the standards department to incorporate ideas of R. C. Kidd, general foreman of V-transmissions and was built by maintenance.

So successful was the initial "crow's nest" that today six of the overhead offices have been or are in the process of being built.

The construction of these offices is such that they can be easily dismantled and moved to any area if necessary. *From Allisonews, published by the Allison Div. of General Motors Corp., Indianapolis, Indiana*

**This overhead office puts supervision "on top of the job." Units like this are used at one of the Allison Div. plants in Indianapolis. The floor level rests about 8 ft above the plant floor level. Round metal columns serve as supports**

## Boiler Cleaning with Acid

THE USE of inhibited acid for the removal of scale from boiler metal surfaces has been practiced for many years. Within the past few years there has been a considerable development in the technique.

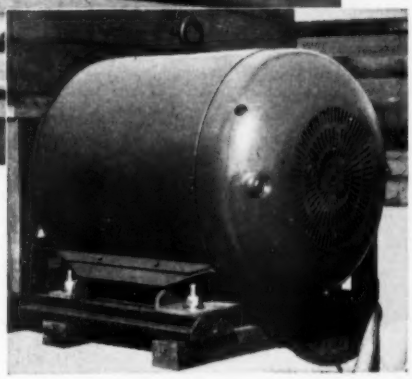
Acid cleaning requires no great dismantling operation and labor cost is kept to a minimum.

Because of its relatively low cost, availability and the number of satisfactory inhibitors obtainable, hydrochloric acid is most widely used in acid cleaning.

Before a new boiler is cleaned with acid, it should receive an alkaline boil-out so as to remove oil, grease, protective coatings and any dirt that has accumulated on the surfaces during erection.

The usual protective measures should be taken prior to acid cleaning such as replacement of any brass or bronze parts temporarily with

*8 cell cooling tower driven by 8 Wagner Multi-speed Motors.*



## Here's a job for *Rugged* motors

This 8 cell Marley Cooling Tower, at Pueblo, Colorado, provides a steady supply of 6600 gallons of cooling water per minute for a steam power plant. There are 8 fans with blades 22 feet in diameter that are driven, through gear reducers, by 8 Wagner two-speed, totally-enclosed fan-cooled motors. These 440 volt motors are each rated 75/19 hp.

Cooling towers need motors with plenty of stamina. They must operate without attention, day in and day out, completely exposed to all kinds of weather.

Wagner totally-enclosed fan-cooled motors are built to operate under severe conditions. They are available in steel or cast iron frames, in standard or explosion-proof types, single-speed or multi-speed, single phase, 2 phase or 3 phase, in ratings to 250 hp.

For your requirements, there is a Wagner Motor to fit every need—a complete line for all current specifications, with a wide variety of enclosure types and mountings. Bulletin MU-185 gives full information. Do you have a copy?

Your nearby Wagner engineer will be glad to help you select the *right* motors for your next application. Call the nearest of our 32 branch offices, or write us.

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

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M53-18

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# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

steel or steel alloy equipment. Any valves connecting the boiler with the main steam header should be closed. Preparation for acid vapor venting should be made.

The "circulation" method is one of two general ways used to acid-clean boilers. In this method, the unit is filled to overflow with clean warm water (temperature should be at the maximum for the inhibitor used) and circulated until a constant temperature is obtained at the outlet. The latter should be located at the highest point of the boiler. The receiving tank should be equipped with a clean water line, steam line and drain.

For circulation, a corrosion resistant pump with 2-hr pumping capacity, slightly greater than the cubical content of the boiler, should be employed.

Inhibited acid is then added to provide a 3 per cent acid solution. Should the continued testing of the solution at the return reveal a 1 per cent drop in acid content, sufficient inhibited acid should be added to maintain a 3 per cent acid content of solvent flowing to the unit.

Circulation of the solvent through the unit continues until the acid content of the effluent is constant, thus indicating the end of the reaction between the solvent and the boiler deposit.

Inasmuch as the danger of corrosion in this type of cleaning does exist, it is necessary to apply appropriate control to factors influencing this attack so that it may be reduced to negligible proportions. *From the Betz Indicator, published by W.H. & L.D. Betz, Philadelphia, Pa.*

## Periodic Valve Inspection Saves Time and Money

PLANNED MAINTENANCE and inspection are the keys to longer valve life.

Primary failures to watch for are leakage past the disc when the valve is closed and leakage through the stuffing box.

Seating area leaks generally start insignificantly, but gain momentum quite rapidly. High velocities which are developed result in wire drawing and erosion of both the disc and seat.

If caught in time, this condition can usually be corrected by a comparatively simple regrinding or refacing operation on the seating surfaces, but if allowed to continue, complete failure is almost certain to result and replacement will be necessary.

Another result of leakage past the seat is formation of condensate and subsequent water hammer. This, as with leakage past the packing in the stuffing box, can result in serious damage. With corrosive fluids, however, this failure is readily detected, particularly if the corrosive begins to attack the stem, bonnet, or other parts of the valve.

Maintenance department personnel, who are responsible for the upkeep of valves, can be either correctors or creators of valve problems. If the wrong tools or methods are used, there's bound to be trouble ahead. It is unfortunate indeed that pipe wrenches are so necessary in the tool kit of a maintenance man. When used for holding pipe, excellent results are achieved, but when this type of wrench is applied to a valve, damage results. Valves are designed with hexagonal surfaces wherever a wrench need be applied, so care should be taken to see that only flat faced wrenches are used.

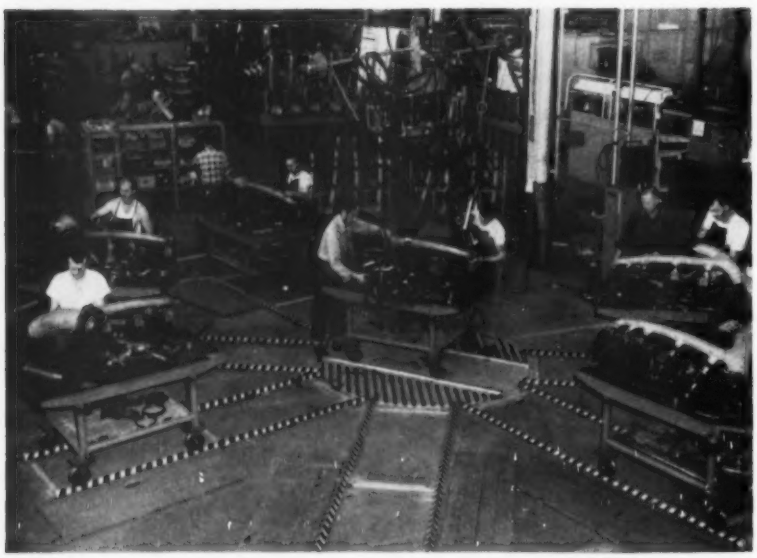
Packing or stuffing boxes are generally designed with an adjustable allowance for packing wear. When this allowance has been completely taken up, the valve is ready for re-packing. It is important at this time to remove all the old packing and replace it with new, and not just add additional packing. The reason for this is that the innermost packing is most subject to wear and consequently most in need of replacement.

A common fault among maintenance men is to remove stem packing with the tang of a file, a screw driver or some similar instrument. The result of this operation is often the marring of the stem and a subsequent leakage through the stuffing box, since the valve depends greatly on the surface condition of the stem for its tightness in the packing area. A score mark on the stem acts somewhat like a file as it passes through the packing and packing life is obviously reduced.

There is available on the market today a simple device called a packing hook, designed to simplify the removal of packing and reduce to a minimum the possibility of damaging the stem. Its use is highly recommended.

The duties of a valve maintenance man should consist of routine inspection, adequate lubrication of moving parts to reduce wear to a minimum and improve performance, cleaning as required to insure proper functioning of all parts, repacking when necessary, and occasional regrinding or resurfacing of the seating surfaces. A planned program of valve maintenance will save money. *From an article by W. C. Hookway, manager, plant engineering, in C A Newscast, published by Cooper Alloy Foundry Company, Hillside, N. J.*

## Turntable, Overhead Spotwelder Make 50 Per Cent Saving in Space

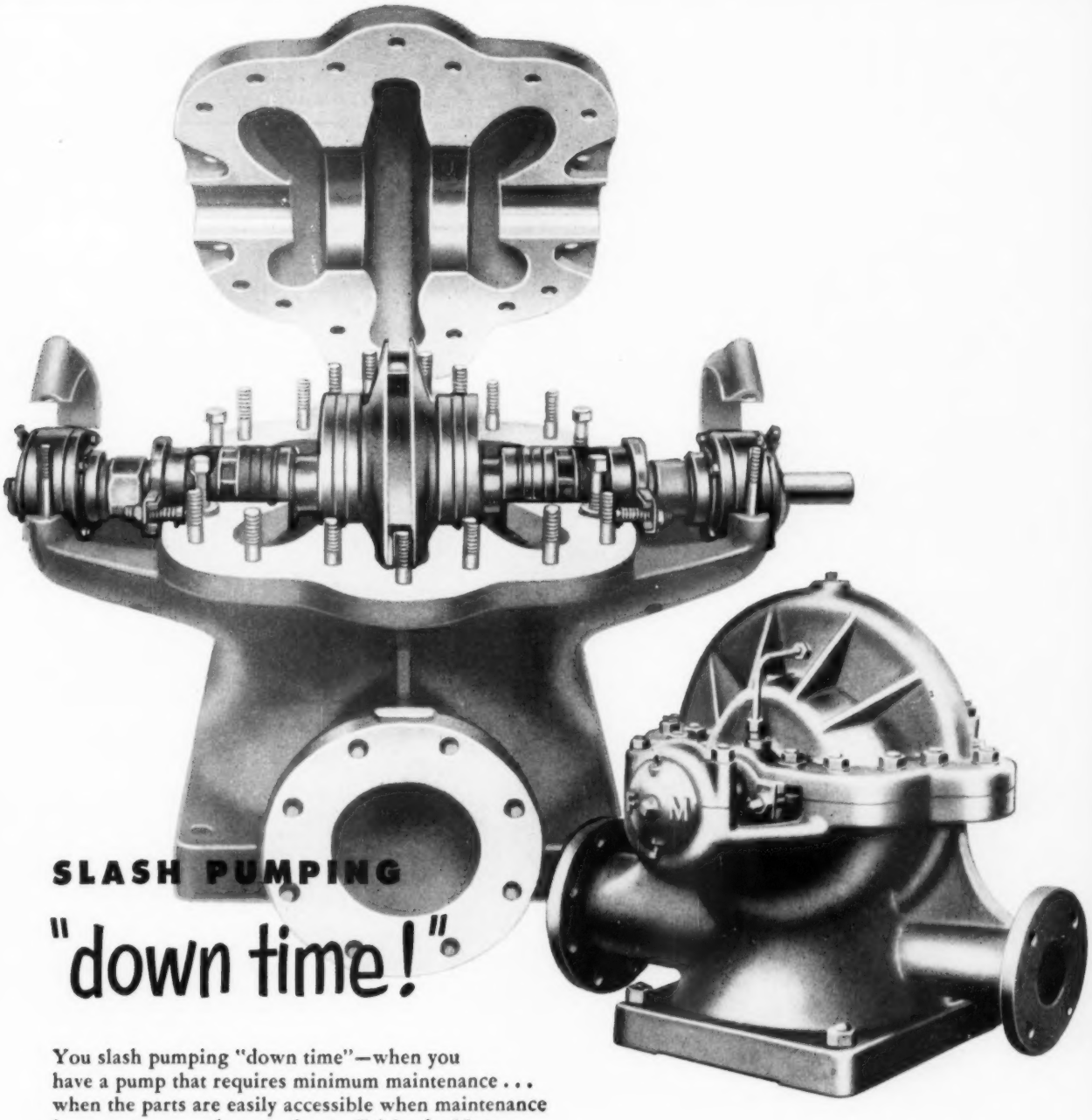


**Dollies, running on wheels and tracks converging on a central turntable, have made a 50 per cent saving in space in one department of the Ryan Aeronautical Co. Turntable, twin spotwelder suspended above, serves seven stations, can be rotated to bring each dolly, carrying engine parts, into position underneath welder. (From the Ryan Reporter, published by Ryan Aeronautical Co., San Diego.)**

## Hard-Facing Extends Pipe Life

CONVEYOR or feeder pipe systems, handling abrasive materials, often present a troublesome problem due to cutting-out of the pipe wall where bends in the line occur.

One successful method of extending the life of an abraded section is to burn out patches with a cutting torch to allow the deposition of metal on the inside of the pipe. After the patch and the inside of



## SLASH PUMPING "down time!"

You slash pumping "down time"—when you have a pump that requires minimum maintenance . . . when the parts are easily accessible when maintenance is necessary . . . when you have a Fairbanks-Morse Split-Case Centrifugal Pump!

See how easily this sturdy pump is inspected . . . lift the split casing and the entire rotating element can be removed without disturbing driver or pipe connections . . . even the bearings can be removed without use of a bearing puller!

See your Fairbanks-Morse Branch Pump Engineer on this Split-Case Single-Stage Centrifugal and the rest of his complete pump line. Fairbanks, Morse & Co., Chicago 5, Illinois.

# FAIRBANKS-MORSE

*a name worth remembering when you want the best*

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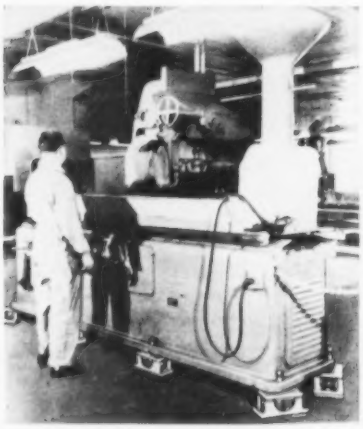
RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

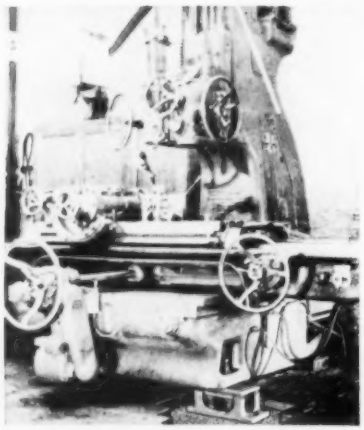
# STOP VIBRATION

WITH

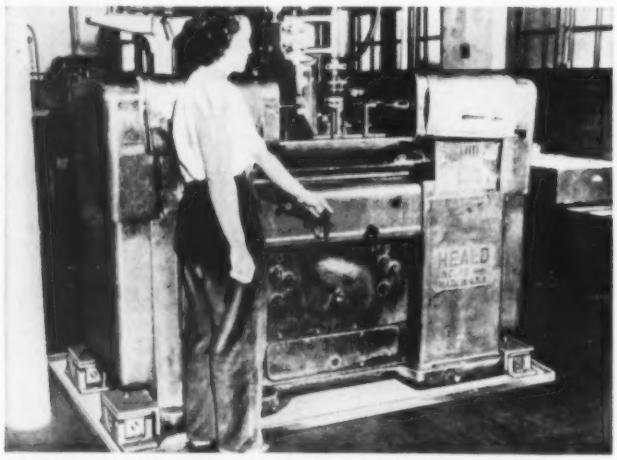
## KORFUND VIBRATION CONTROL



This Thompson 12" x 60" Surface Grinder is installed at Firth Sterling, Inc., Pittsburgh, Pa. Vibration from grinders affected precision testing equipment on floor below; vibration and noise was also extremely annoying in executive, sales and laboratory offices. Korfund Isolators directly under the grinders, completely solved the problem. Korfund Units stop vibration and insure quieter machine operation.



This Pratt & Whitney 23B Jig Borer is installed at Caterpillar Tractor Co., Peoria, Illinois. Korfund Vibro-Isolators protect this precision machine against severe external vibration from trucks and trains which had made accurate work impossible. Isolators are set in pockets made by removing wood block flooring. Korfund Units stop vibration and reduce rejects—improve work quality.




This is one of the Heald 249 Bore-Matics installed at Thompson Products Co., Cleveland, Ohio. Shock transmitted from one automatic boring machine to another caused intermittent skips and gauges. One machine had to be kept idle until both were mounted on Korfund Isolators. Now they operate together and turn out perfect work. Korfund Units stop vibration and increase production.

**Korfund Vibration Control also: permits more efficient plant layouts, decreases original building and foundation costs, permits installations without reinforcement of floors, reduces machine maintenance costs, and lengthens machine life.**

**Standard Korfund Isolators are available for most applications. A Selector Chart giving recommendations for both normal and critical conditions is available. See Sweet's Catalog Files or write us for Bulletin No. 5.**

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-35R Thirty Second Place, Long Island City 1, N. Y.

In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

**For more facts circle 524 on Reply Card**

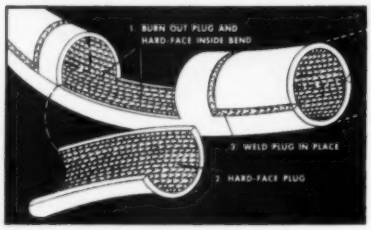

# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

the pipe are hard-faced, the section removed is welded back in place to make a completely surfaced inside wall.

Sometimes, instead of a solid deposit, fairly high and properly spaced circumferential beads of hard metal will suitably protect an abraded area. Acting as small dams, the beads retain a certain amount of the material being conveyed—effecting wear against itself.

Since welding time for most electrodes is about the same, labor costs per pound of deposit remain fairly constant—regardless of what alloy is deposited; protection afforded by a better though more expensive




**This view shows how plug can be removed from pipe for hard-facing. It is welded in place at completion of job**

alloy is nearly always well worth the higher initial cost. *From Fusion Facts, published by Stoody Company, Whittier, California.*

## Acetylene Tips

SAFE and efficient cutting and welding depends upon safe and efficient equipment as well as on the use of proper technique.

Because of the instability of acetylene at pressures above 15 psi, industry has supported regulations which forbid its s'orage as a free gas at higher pressures.

This condition would have made distribution of acetylene difficult except that increased knowledge uncovered a way to overcome this property and allow a practical amount of acetylene to be contained in a cylinder of convenient size.

It was discovered that acetylene can be stored under gage pressure of several hundred pounds per sq in. in perfect safety if the gas is dissolved in a liquid solvent and separated into minute amounts.

The Interstate Commerce Commission regulates the charging pressure of acetylene cylinders, limiting it to 250 psi at 70 F. Each Prest-O-Lite cylinder is charged up to the maximum pressure but never higher.

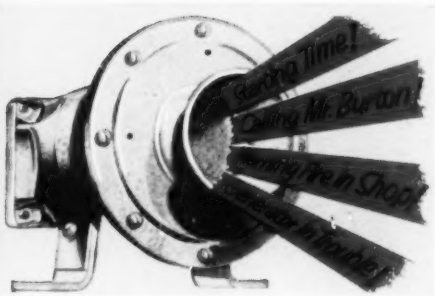
When using acetylene for cutting and welding, do not use more than

(Continued on page 38)

Tells you how to use Benjamin Sound Signals as

# "The 20th Century Pony Express"

## to Sound the Alarm against Production Enemies

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G105

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# BULLETINS just released and of immediate plant interest

## INSTRUMENTS, CONTROLS

**101 Industrial Controls**—Catalog 8305, 84 pp, describes and illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity; also pneumatic and electric valves, switches and relays. Indexed and compiled for easy use, catalog provides specifications, dimension drawings, application data and ordering information. Industrial Div., Minneapolis-Honeywell Regulator Co.

**102 Pressure Primary Element Transmitter**—Bulletin A-706 describes company's Type P2T pressure primary element transmitters for use with automatic electronic controlling and recording systems, giving data on principles of operation. Illustrated; includes pressure ranges and span. The Swartwout Co.

**103 Liquid Level Control**—A single-thyratron electronic liquid level control operating without radio frequency from a single, capacitive type probe is described in Form LL4-453. Illustrates single-unit control, probe, and alternative schematic arrangements for installation. Includes specifications. Thermo Instruments Co.

**104 Temperature Control**—Bulletin F 5783 describes company's Model 200 Series Capacitrols, stressing one which incorporates "straight line" temperature control. Explains electronic control principle utilized in this direct reading controller, gives advantages. Wheelco Instruments Div., Barber-Colman Co.

**105 Recording Potentiometers**—Three new specification sheets describe and illustrate Brown ElectroniK recording potentiometers. Specification Sheet 160 covers circular chart recorders; Specification Sheets 164 and 165 cover single and multiple record strip chart recorders. Construction and engineering details included. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

**106 For Viscosity Control**—Eight-pp Bulletin V-1000E covers a line of viscometers for industrial viscosity control. Describes indicating, recording and controlling equipment, and illustrates models available for various operating pressures and for applications requiring explosion-proof design. Norcross Corp.

**107 Electronic Utilities Control**—New applications of electronic time and program controls are outlined in this folder. These controls, used with proper intermediate electrical devices, offer automatic means of programming starting and stopping of mechanical functions without need for special wiring. Also describes a portable paging system for contact between "transient" personnel and central office. International Business Machines Corp.

## MATERIALS HANDLING

**108 Operating a Fork Truck**—Designed primarily to give informative operating tips to new users of this manufacturer's equipment, this 8-pp instruction booklet is of interest to users of any fork truck equipment. Featuring a complete suggested training program for operators, it covers each step in actual operation . . . what to do before starting truck, putting truck in motion, operation of lift and tilt, stacking etc. Preventive maintenance is stressed and safety tips included. Lewis-Shepard Products, Inc.

**109 Power Trucks**—Twelve-pp Form B-167 is a condensed general catalog covering trucks for a wide range of industrial handling jobs. Describes and pictures high- and low-lift platform trucks, fork-lift trucks and cranes, discussing design details and operating advantages and including specifications. The Elwell-Electric Parker Electric Co.

**110 Lightweight Handling Equipment**—This catalog presents handling equipment constructed of aluminum and weighing ⅓ to ⅙ as much as many types of similar equipment, i.e., a platform truck weighing 97 lb with a 2000-lb load capacity. Catalog includes a filing-size folder of general information on the line, and illustrated specification sheets on platform trucks, A-frames, tote boxes, work tables, racks, other equipment. Tobey Mfg. Corp.

**111 Wire Conveyer Belts**—Typical applications of woven wire conveyor belts in four types of industries are described and pictured in Bulletin 105. These show ways in which such belts serve to cut handling and processing costs and increase production. The Cambridge Wire Cloth Co.

**112 Track Materials**—Savings in time and money through single-source buying of industrial track materials and supplies is stressed in 44-pp Catalog 575A. Includes illustrations, descriptions and specifications of crossings, frogs, gage plates, guards, rails, guard rail clamps, heel blocks, rail braces, combination slide plates and braces, switch points, switch materials for light rail installations. L. B. Foster Co.

## VALVES, PIPING AND ACCESSORIES

**113 Valve Selection Guide**—Catalog 352A, 44 pp, lists needle, globe, plug, check and relief valves, also gage protectors, and snubbers, bleeders, and special valves. These units are made of various metals, including brass, bronze, steel and aluminum alloy, and suitable for instrumentation, processing industries, hydraulic systems, industrial and other applications. Details of construction are shown; specifications and dimensions given. Republic Mfg. Co.

**114 Disc Valves**—Circular 558, extensively illustrated, gives dimensions and functions of non-metallic disc valves. Lists in detail those which can be renewed or converted to handle another type of service, simply by insertion of a specially designed disc. The Lunkenheimer Co.

**115 For Underground Piping**—An insulation specially designed for underground heated piping is the subject of this 8-pp bulletin. Stresses permanence, economy, extra protection and other features of this lightweight insulating concrete. Illustrates typical conduit arrangements, discusses provisions for expansion, re-insulation of existing conduits. Includes heat loss tables. Z-Crete Div., Zonolite Co.

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Use this space to ask for tear sheets, other information wanted.

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**116** **Steel Unions**—Six types of cold forged steel unions featuring an improved coating, better over-all protection and more resistance to corrosion are described and pictured in this bulletin. Tells best applications for each type, includes sizes, prices. Rockwood Sprinkler Co.

**117** **Low Pressure Filters**—Four new pipe line filter models designed for low pressure to 40 psi are introduced in Bulletin 210. Contains specifications, engineering and performance data on filters for the removal of dust, dirt, pipe scale, condensed oil and water vapor from compressed air lines. Dollinger Corp.

## DUST CONTROL

**118** **Clean Air for Control Rooms**—Application Study 108 covers use of electronic cleaners in providing clean air for a steel mill power house control room and disconnect chamber. Explains how these cleaners protect intricate electrical equipment from being coated with airborne dirt which could cause short circuits. Discusses benefits obtained, including no power shutdowns since installation, more accurate instrument operation, greater employee comfort. Trion, Inc.

**119** **Self-Cleaning Dust Collector**—Bulletin 915, 6 pp, describes company's Type CH-3 self-cleaning cloth screen dust collector. Illustrates engineering features of the unit which uses the principle of reverse air flow for continuous cleaning of the cloth filters. Also discusses features which reduce operating and maintenance costs. Pangborn Corp.

**THIS MONTH'S LITERATURE OF MERIT gives pointers on roofing problems...lists reading aids on welding...tells how to care for belting**

**120** **Solving Roof Problems**—Plant engineers concerned with roof maintenance will find this 32-pp brand new edition of company's popular roofing booklet an authoritative discussion of the matter. Illustrated by photos, drawings and diagrams, it covers the various types of roofs, their construction, factors entering into their deterioration, and the diagnosis and treatment of roof troubles. Typical subjects included are: laying the built-up roof; repair of copings and parapets; area treatment. The Tremco Mfg. Co.

**121** **Bibliography of Welding Aids**—Available technical information on the welding of stainless, low-alloy high-tensile and non-ferrous metals is listed in 16-pp illustrated Form 10528. It serves as an index and guide to a series of bulletins, charts and articles prepared as "working tools" to facilitate welding and aid those responsible for plant welding practices to attain quality results. Arcos Corp.

**122** **Conveyor and Elevator Belting Tips**—This 32-pp manual on installation, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades, and a review of engineering information needed to specify a conveyor belt. Repair methods, splicing and fastening are also covered, and there's a table listing common conveyor belt maintenance problems with their causes and remedies. The B. F. Goodrich Co.

## ELECTRICAL

**123** **A-C Line Regulators**—Sixteen-pp Catalog 353 gives information on electronic a-c line regulators; also presents newly introduced electronic frequency changers. These instruments are designed to convert 60-cycle line to regulated 400-cycle or regulated 50/60 cycle. Catalog provides information on electronic regulator circuitry, uses of regulators, and requirements for special regulators; general and electrical specifications. Sorenson & Co., Inc.

**124** **Power Packs**—Eight-pp Bulletin GEA-5928 presents company's Inductrol Power Packs for a-c lighting and power service up to 112.5 kva, 600 v and below. Explains why voltage should be regulated and the advantages of using packaged equipment to provide this regulation. Also gives data on three-phase Inductrol Power Packs. General Electric Co.

**125** **Power for Electrolytic Processes**—Ways of obtaining d-c power for electrolytic processes are described in 16-pp Booklet B-5426. Evaluates factors that would determine the choice of method, discussing three basic conversion systems: ignitron rectifier, motor-generator set, and rotary converter. Consideration of conversion methods is followed by charts to aid in selecting best d-c operating voltage, and a discussion of the advantages and disadvantages of private generation of power. Westinghouse Electric Corp.

**126** **Power Conversion Units**—Eight-pp Bulletin GEA-5858-B lists design features, advantages, performance, circuits, dimensions and ratings for a line of metallic rectifier power conversion units, rated from 125 to 250 v d-c. Also provides guide to aid in preparing contract specifications which entail company's d-c power supplies and exciters. General Electric Co.

**127** **Distribution Transformers**—Features of company's distribution transformers in ratings of 167 kva and smaller, 15,000 v and below, are described in 12-pp Bulletin 61B6159D. Includes such mechanical information as standard low-voltage connections and high-voltage bushing arrangement along with recommended installation practice. Allis-Chalmers Mfg. Co.

**128** **Solderless Terminals**—Here's a 90-pp generously illustrated catalog covering solderless terminals and connectors according to wire sizes. Provides general information on the line as well as detailed data on pre-insulated and non-insulated terminal types available; wiring and wire termination, also tooling. Well indexed for easy reference, book gives sizes, application suggestions, and includes a section of pertinent engineering data. Also features a handy guide for use in terminal selection. Aircraft-Marine Products Inc.

**129** **Plug-In Panelboard**—This 8-pp booklet describes company's Noark Flexunit plug-in distribution panelboard, listing specifications and enclosure sizes and covering exclusive features of the unit. Federal Electric Products Co.

**130** **Insulating Varnish**—Eleven-pp Booklet 65-120 presents baking and air drying types of company's Tuffernell insulating varnishes, along with a three-phase research and testing program and discussion of the importance of viscosity control to the varnish user. Gives properties of each type of baking and air drying varnish, tells applications for each insulating material. Also covers properties and applications of insulating and finishing enamels, insulating glues, paints, lacquers. Westinghouse Electric Corp.

*(Continued on page 169)*

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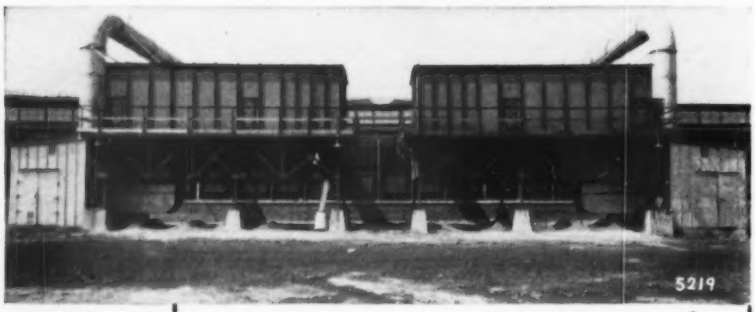
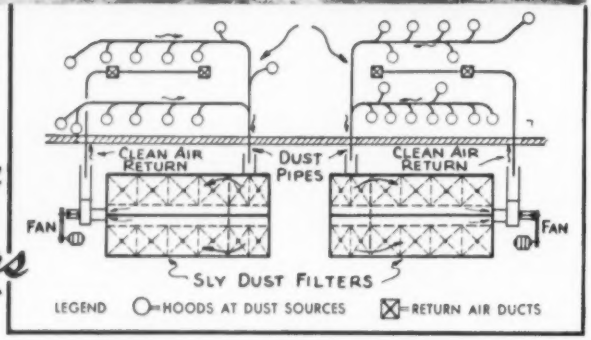
# SLY PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL




*Sly Dust Filters at the modern plant of the Macklin Co., Jackson, Mich., manufacturer of grinding wheels and abrasive products.*

*double savings*

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These two Sly Dust Filters were installed to replace several cyclone collectors which had permitted the fine dust to pass through to the atmosphere.

1. The plant then became entirely *dust-free*—noticeably reducing maintenance and improving production.
2. The filtered air is so clean that it is returned to the building, with a heat saving of *five dollars per hour.*

You may have a dust problem similar to that of the Macklin Company. Theirs resulted from lathes finishing abrasive grinding wheels.

With some 50 years' experience in handling all kinds of dust conditions, we are in a position to suggest a solution to your dust problem—possibly with a substantial saving. May we have the opportunity?

THE W. W. SLY MANUFACTURING CO.

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# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

1/7 of the cylinder contents per hour. This is a consumption rate of 46 cu ft per hr when using the new WK cylinder containing 323 cu ft of acetylene.

Small amounts of liquid acetone may be drawn off if a cylinder has been lying on its side for a long period of time. Before using such a cylinder, place it upright for several hours.

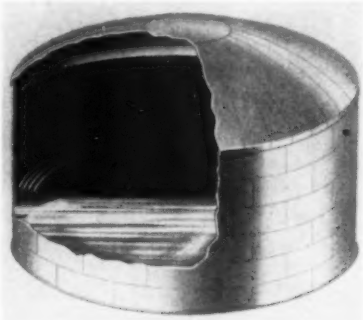
The T-handle socket wrench for opening the valve should be left in position during cutting and welding so the valve can be closed quickly in any emergency. And remember, when opening the valve not to turn the wrench more than one and a half turn. This opens the valve.

If acetylene leaks around the valve spindle when the valve is opened, close the valve and tighten the gland nut to compress the packing around the spindle. If this does not stop the leak, close the valve, and attach a tag to the cylinder stating that the valve is unserviceable. Then notify your supplier. If acetylene leaks from a closed valve, move the cylinder outside and place a warning sign on it to prevent ignition. *From Linde Tips, published by Linde Air Products Company, Division of UCC, New York, N.Y.*

## Floating Film Seals Tanks

ABILITY TO "roll with the punch" is one of the attributes of Vulcafilm, a rubber compound combining some properties of plastic materials and some of synthetic rubber.

Vulcafilm, with electronically "welded" seams stronger than the



**This cutaway drawing of a fuel storage tank shows diaphragm which rises and falls with liquid level, sealing tank**

material itself, unlike other plastics, withstands temperature and chemical attacks of fuel oil. For this reason, its principal use to date has been as a seal for fuel storage tanks. The film is made into diaphragms

# MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

## Two New Bassick Casters To Save You Money

***New low-cost 5" and 6" sizes for loads up to 1400 lbs feature Double Ball-Bearing Swiveling***

Big news this month from Bassick, world's largest maker of casters, is the development of two new high-efficiency casters for shop trucks and mobile equipment used in factories, stores, warehouses, hotels, hospitals, laundries, etc. They join the famous "68" series (and are matched by identical additions to the "08" series of rigid casters) popular everywhere for fast, easy swiveling and built-to-last construction.

***Six-inch Wheel***

No. H6686-2-1 — with soft rubber tread for loads up to 250 lbs.

No. H6689-2-1 — with Atlasite solid composition tread for loads up to 350 lbs.

Both types have 1¾-in. tread width roller bearing wheels with thread guards.

***Five-inch Wheel***

No. H5686-2-1 with soft rubber tread for loads up to 200 lbs.

No. H5689-2-1 with Atlasite solid composition tread for loads up to 300 lbs.

Both types have 1¾-in. tread width roller bearing wheels with thread guards.

### Three Big Reasons Why They Save You Money

LOWER INITIAL COST . . . Actually priced lower than most less efficient 5" and 6" casters having only single ball race bearings.

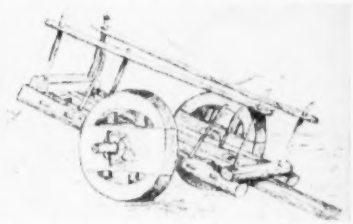
EASIER SWIVELING . . . The Bassick "Diamond-Arrow" *double* ball-bearing swivel construction provides the highest degree of swiveling efficiency.

LONGER LIFE . . . Raceways are fully case-hardened for extra durability and longer service life.

### GET THE FACTS ABOUT THESE NEW MONEY-SAVING CASTERS

Write to us or ask your industrial distributor salesman for the full story on these two new Bassick casters. Let us show you how they can save you money three ways: lower initial cost . . . easier operation . . . longer life. We're ready to show you samples of the new casters and what they can do to speed up movement of needed materials through your shop or plant.

***Man's First Invention?***



Some experts say the wheel is man's original invention. Nature, they claim, gave him a hand or a hint for other basic ideas like fire, boats and airplanes. But the wheel emerged full-blown as the brilliant idea of some unsung Stone Age wool-gatherer.

The primitive cart shown above is equipped with massive wheels hand-hewn from a tree trunk. The wheels show considerable ingenuity of design. A rude form of hub has been introduced, consisting of a separate circular piece inset into solid wood. Not a scrap of iron was used in the construction of the entire cart.

Materials-handling has come a long way since this cart, and wheels continue to be one of the most important products in modern civilization. They are the basis of practically all easy movement. Today, Bassick industrial wheels are made in a large range of materials, sizes and capacities for use as wheels or in Bassick casters. If you want to make sure your production keeps rolling, check with your Bassick industrial distributor. He'll be glad to recommend the best Bassick caster or wheel for the job. Or write directly to Bassick at the address below.

THE BASSICK COMPANY
Bridgeport 2, Conn.
*In Canada:*
Belleville, Ont.

**Bassick**
A DIVISION OF
STEWART SW WARNER
MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

**For more facts circle 529 on Reply Card**

When you have a packing problem . .

Consult

# J. E. RHOADS & SONS

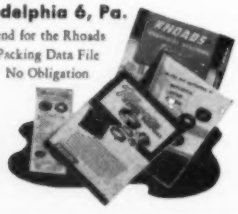
Rhoads offers you sound engineering advice on the selection, application and installation of Tannate Leather Packings. This is based on Rhoads' long experience custom-manufacturing packings to fit-the-job and on the results of countless installations.

A Rhoads Direct Factory Representative will discuss your problems with you and show you how the application of Tannate Leather Packings can provide long, uninterrupted production, reduce replacements and result in more pieces produced per hour. Tannate Packings have these features: low co-efficient of friction; do not cold flow; will not score or abrade; require no lubrication.

So let us talk over your needs or send us your packing requirements for quotation. Include type, service, pressure, temperature, dimensions and quantity. Write . . .

**J. E. RHOADS & SONS**
**35 N. Sixth Street, Philadelphia 6, Pa.**

Send for the Rhoads Packing Data File No Obligation




**RHOADS**
**INDUSTRIAL LEATHERS**

**PHILADELPHIA • NEW YORK • CHICAGO • ATLANTA**

**For more facts circle 530 on Reply Card**


# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

with float on top of the liquid, sealing the tank and thus preventing losses from evaporation. These losses sometimes amounted to 10 per cent of the total volume.

The compound for the film may be modified for resistance to oil, gasoline, sunlight, heat, cold, abrasion and acids and may be joined by vulcanizing or cementing in addition to "welding." *From an article by George Mentzer, Machine and Process Development, in Circle-News, published by the B. F. Goodrich Co., Akron, Ohio.*

## Tail-Line Protects Workers

**A tail-line is good insurance against accidents while working above ground. Worker in refinery Car Shop has tail-line properly adjusted, and wears the additional protection of tin hat and goggles. (From Lion Oil News, published by Lion Oil Co., El Dorado, Ark.**

## Vest for Worker Protection

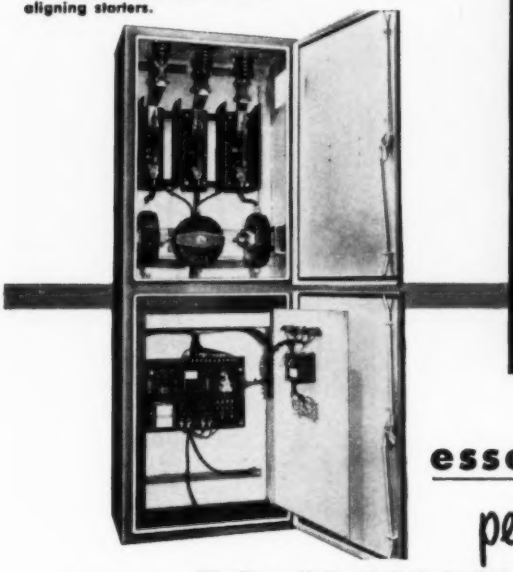
SOME time ago, a high-speed milling machine at Lockheed Aircraft threw a tooth from its cutter. Flying from the machine, the heavy chunk of steel hit the operator's belt buckle, glanced upward, and tore open his arm.

The accident was promptly investigated by a safety engineer who, as a result, sought a means of protecting the operator. Since the machine could not be shielded, it was decided that some sort of personal armor would solve the problem.

With the help of the research department a molded armored vest of glass cloth laminated with plastic was made. According to the safety

600-Ton Verson Hydraulic Press for forging 155 mm projectiles. EC&M VALIMITOR Starters provide continuous protection for the 2300 volt hydraulic pump motors serving several of these Verson All Steel Presses in a southern shell plant.

A typical 2300 volt EC&M VALIMITOR Cubicle Starter with self-contained bus at top for connecting all the adjacent self-aligning starters.



## essential drives deserve *permanent* "short-protection" and EC&M VALIMITOR Starters provide it

*write for T9-117 reprint bulletin*

Recently, in the case of a new plant, the consulting engineers were obliged to refigure "short-possibilities" twice because of changes in power plans. They also had to re-check all power equipment, including circuit breakers and motor starters.

Then—they heard about EC&M VALIMITOR Starters, which offered an ideal solution to the knotty problem.

No more calculations . . . no worry about starters being outmoded by an unexpected increase in available KVA, now or in the future. Furthermore, these EC&M Starters could be ordered by specifying only the motor name-plate data —, and after being applied, there was no danger of getting caught "short" with a "short" the starters couldn't handle. EC&M VALIMITOR Starters give *permanent* protection. Investigate them for your 2300-4600 volt motor-drives.

**THE ELECTRIC CONTROLLER & MFG. CO.**
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

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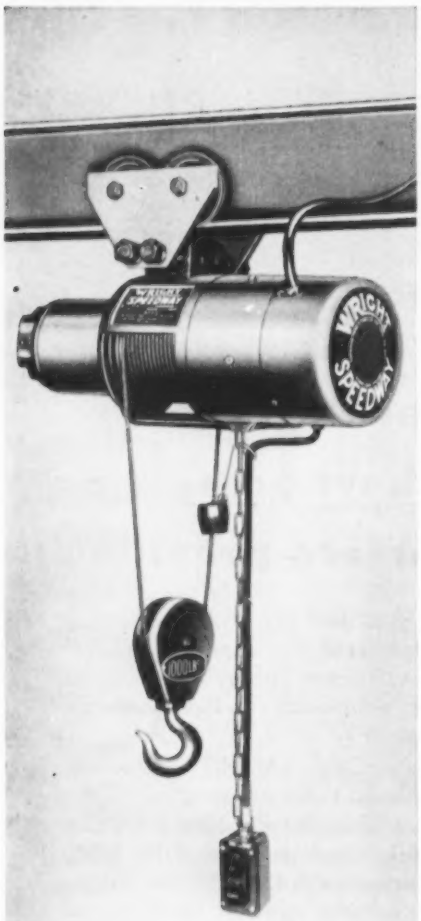
ACCO products

Wright Speedway Hoists

Why WRIGHT Speedway Hoists Last Longer . . .



● 5 key features of WRIGHT *Speedway* Hoists mean longer life and less servicing. These features are heat-treated and surface-hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake and ball bearing gear shafts.

And there are other features which add further to the fine service you get from a WRIGHT *Speedway* Hoist. For instance—grooved cable drum, improved plow steel preformed cable, concealed motor wiring, and completely enclosed, ventilated housing weatherproofed for permanent outside use. Ball and roller bearings seldom require additional lubricant. Gear train is sealed in oil bath chamber.

You can get standard lift, long lift, or close headroom WRIGHT *Speedway* Hoists in capacities from ¼ to 10 tons—all with these same quality features. See your local WRIGHT distributor or write our York office for **DH-133-A.** WRIGHT will save you money.

ACCO

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

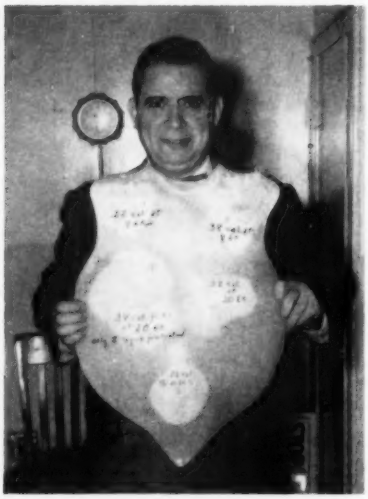
York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

WRIGHT Hoists Trolleys Cranes

For more facts circle 532 on Reply Card

# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)



**Safety engineer John Paul wears the vest that passed firing tests with ease**

engineer, with this type of vest construction the layers of cloth would rip loose separately as an object penetrated, slowing it down with each layer.

Under test, the armor worked admirably. It would withstand .38 caliber pistol fire at 8 ft, and bullets would go less than half way through. The vest weighed less than 3 lb, was only ⅛ in. thick.

The safety engineer designed a "lap flap" so that the person wearing the vest could kneel comfortably, and this item made the vest patentable. Lockheed has a patent pending on it and a vendor who wants to build the vest commercially. *From Lockheed Star, published by Lockheed Aircraft Corporation, Burbank, California.*

## On Cathodic Protection

CATHODIC PROTECTION is a means for overcoming or neutralizing electric currents which are responsible for corrosion at a metallic surface. This is done by supplying an external electric current to the metal through the corrosive medium sufficient to overcome natural corrosion currents leaving the metal and entering the electrolyte. Corrosion usually occurs only at the anodes.

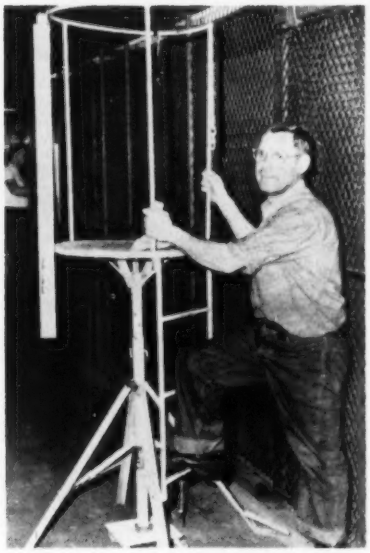
Areas from which current enters the electrolyte are called anodes, as contrasted with areas where current enters the metal from the electrolyte, called cathodes.

The situation is not unlike the continuously climbing squirrel in a rotating cage who gets nowhere in the frame of reference passing

through the axis of the cage despite much running.

Metal ions tending to leave the metal lattice in accord with their normal corrosion behavior, find themselves where they started because current entering the metal continually tends to bring them back, thereby preventing their entering solution in water. As long as this external current is supplied adequately, no corrosion of the metal can occur; in this sense, cathodic protection is capable of reducing corrosion virtually to zero. *From an article by H. H. Uhlig, in The Technology Review, (M.I.T.), Cambridge, Massachusetts.*

## Portable Scaffold For Light Work



**Scaffold, surrounded by hand rail and chain, is easily moved around plant, saves time in cleaning lighting fixtures. Platform may be raised or lowered. (Suggested by Andrew Freeman, Packard Electric Div., in GM Folks, published by General Motors Corp., Detroit)**

## Solvent Safety

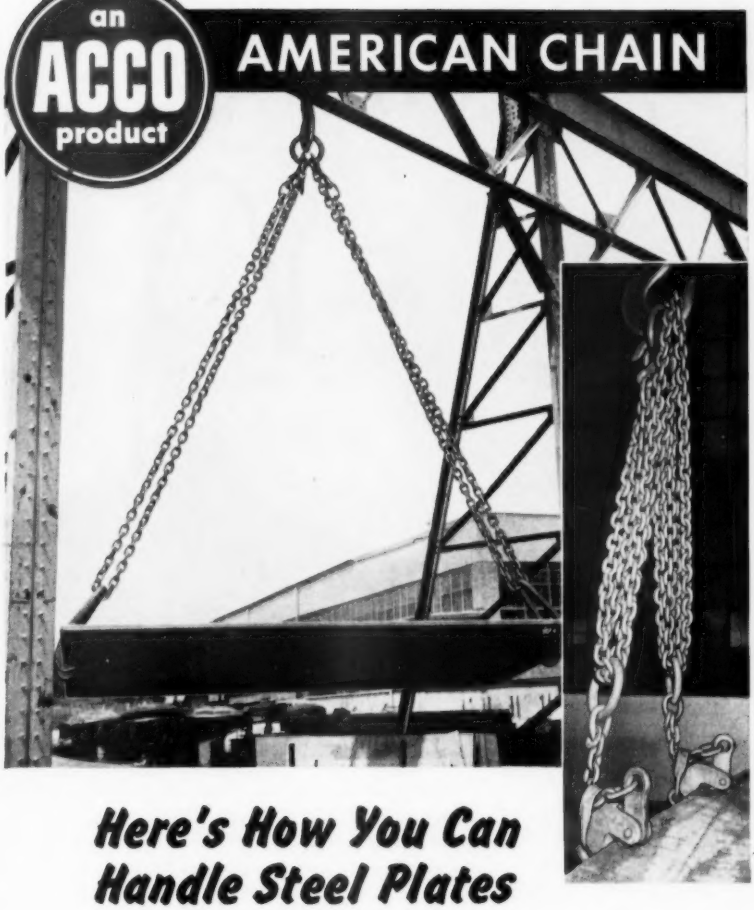
ONE OF THE REASONS there is a solvent cleaning problem in many plants is the fact that two of the most effective industrial solvents are highly toxic and one of them has a low flash point. These are carbon tetrachloride and benzol. They are used both straight and as components of mixed solvents. Trade names under which they are frequently sold give no clue as to their composition.

There is no question but that carbon tetrachloride and benzol can be used safely as cleaning solvents for the occasional cleaning job that most plants have but experience indicates that they are not so used.

One large casualty insurance company reports 8 to 12 deaths every year from the occasional or infre-


an ACCO product

AMERICAN CHAIN



**Here's How You Can Handle Steel Plates**

• These pictures show only two applications of an AMERICAN 125 Endweldur alloy ACCO *Registered* Sling Chain with ACCO series 80 Sling Hooks. The 2 legs are long enough for use with various length plates. They can also be used in a double-basket hitch for lifting two or more plates together.

The big advantage in using this AMERICAN Chain is in the small diameter, light weight, and great strength of the tough alloy chain, and in the short links which make the chain so flexible and easy to rig. See it in the right hand picture above.

Inside the plant this same sling chain is used in a wide variety of lifts on castings, housings, and finished machines. It has become sort of a "jack-of-all-trades."

AMERICAN makes sling chains for every use with ACCO grab, sling, foundry, and special hooks. Note (*above*) the two ACCO *Registered* Sling Chains on the plate grabs. The ACCO Sling Chain Catalog gives you full information on America's finest chain slings—AMERICAN.

***Write** to our York, Pa., office today for Catalog DH-314*

ACCO

TRADE MARK

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

American Chain

**For more facts circle 533 on Reply Card**

# UNUSUAL USES

**A Few Unusual Uses**

- BENCH CLEANING
- METAL RECLAIMING
- MILLING CHIPS
- SOAKING PITS
- SUMP CLEANING
- TANK CLEANING
- TIN PLATE CLEANING
- WELDING FUMES AND
- FLUX AND
- ALL AROUND
- SANITATION

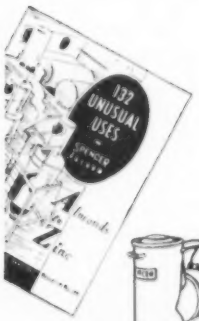
When records are cut, the loose wax gets in the way and has to be removed. The illustration shows a special vacuum tool applied at the cutting point. All waste material goes into the vacuum line down to an enclosed container in the basement.

The same application applies for metal cutting, or for reclaiming gold, babbitt, solder and welding flux.

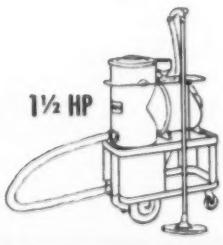
Also, with the same equipment you can remove water, hot ashes and chemical dusts at the point of generation.

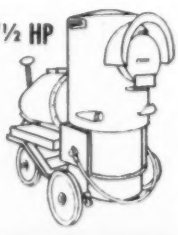
And with all, you can clean the entire plant including walls, ceilings and overhead pipes, with the same equipment.

A few of the portable systems are shown below. For larger jobs a Spencer Stationary System is recommended. Let our representative look over your plant and send for Bulletin No. 144.



1 HP


1½ HP


7½ HP

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER
HARTFORD

466-C

For more facts circle 534 on Reply Card


# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

quent use of carbon tetrachloride to clean parts or objects that for some reason or other do not fit in the regular production schedule.

These are cases where the medical picture shows the expected—acute liver damage characteristics of carbon tetrachloride poisoning. Phosgene or other breakdown products can be ruled out because of the circumstances.

Although these two solvents can be used safely, the record is so bad that the first thought should be one of possible substitution. *From Safety Newsletter, published by the chemical section of the National Safety Council, Chicago, Ill.*

## Safety Barrier Prevents Injury

**The steel frame at the junction of two conveyors has been designed by Apex employees to keep people from sustaining injury by stepping on conveyor rollers. (From a release for Apex Electrical Manufacturing Co., Cleveland.)**

## Maintenance of Open Hearth Furnaces

THERE ARE FEW industrial furnaces that require so varied a selection of fire brick as does the open hearth steel making furnace.

A campaign is generally considered the life of the main roof. The roof is usually replaced three to four times a year and at these times the furnace undergoes complete inspection and repair. Generally, most repairs of the furnace proper are made at or above charging floor level, but about once a year it is necessary to make a complete rebuild which entails replacing refractories down to the slag pocket level as well as replacing all or part of the checkers.

Before the masons can begin rebuilding, certain sections which have received the most severe wear must be earmarked for "tearing out" by

# "When SPRING comes, can WINTER be far behind?"

## Plan your INSUL-MASTIC outdoor coating now!

We've got Shelley's immortal line turned around backwards. We did it on purpose to remind you that spring and summer is a good time to have your outside maintenance work done. Plan now to have the heavy duty protection of INSUL-MASTIC coatings applied to your metal and masonry this summer.

There is no better way to prevent corrosion and moisture penetration than with INSUL-MASTIC coatings. They last for years and years—even in contact with acids and alkalis.

**Here are some of the many places in your plant which may need a good, heavy INSUL-MASTIC coating as protection against weather and industrial vapors:**

STRUCTURAL STEEL —**needs protection from corrosion**

LEAKING WALLS AND ROOFS —**need sealing**

COLD TANKS AND PIPES —**need condensation control**

ACID AND ALKALI TANKS —**need protection from spillage and vapors**

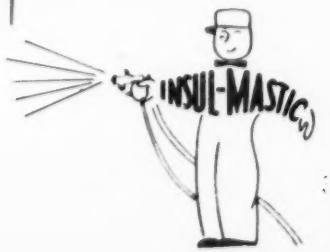
HEATED STORAGE TANKS —**need protection against heat loss and corrosion.**

THERMAL INSULATION —**needs to be kept dry.**

*Check your plant now. Line up the equipment to be coated this summer. Act now so that when winter comes such work will be far behind you.*

*Think first of the coatings that last!*

**For engineering assistance, call upon Insul-Mastic. Our technical staff will gladly advise on insulating, vaporsealing, corrosion prevention, weather sealing. Our experience in these fields is yours to draw upon.**




# Insul-Mastic

CORPORATION OF AMERICA

Oliver Building • Pittsburgh 22, Pa.

Representatives in Principal Cities

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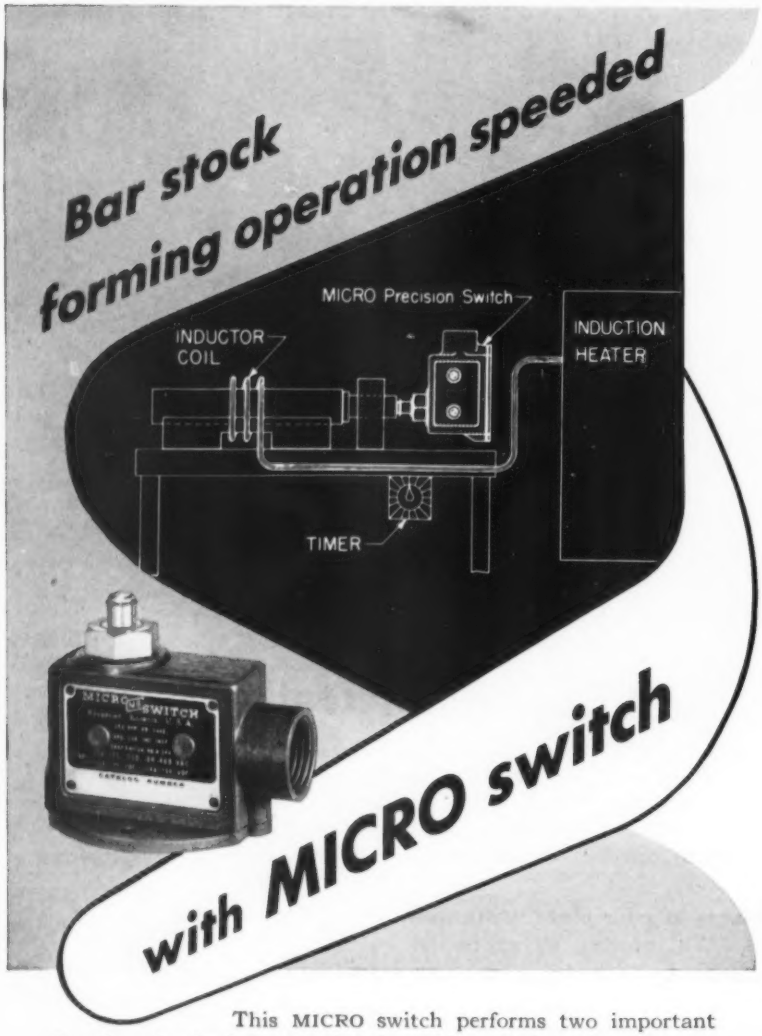



This MICRO switch performs two important functions in the induction heating of bar stock to form harrow teeth. It controls both heating and bar position.

Operator slides the bar down a grooved surface through a back stop until it contacts the switch plunger. This assures the proper position of the bar in relation to the induction heating coils. The switch then actuates a timer which starts the heating cycle. One man thus performs both the heating and pulling operations with utmost efficiency.

In thousands of plants, all over the country, engineers and maintenance men are using small, dependable, ruggedly-housed and easily-mounted MICRO switches to make their equipment safer, more automatic and more productive. Complete stocks of these versatile switches are readily available to plant operators from authorized MICRO distributors in 142 cities. Look under "Switches, Electric" in your classified telephone book.

*Ask us to send you* MICRO TIPS, *a live publication packed with practical ideas to speed plant production.*

**MICRO** A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

MAKERS OF PRECISION SWITCHES

FREEPORT, ILLINOIS

**For more facts circle 536 on Reply Card**


# PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

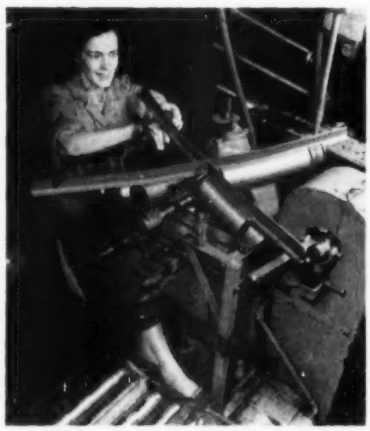
the masonry superintendent and "tear out" crews set to work with crowbars and pneumatic hammers. After the thin areas are removed and scaffolds erected, the masons arrive.

It has been found that super duty silica makes the best main roof. This is due mainly to the high refractoriness and mechanical strength at temperatures around 3000 F which are prime qualities of this type of brick. Several years ago most open hearth shops used standard silica brick for main roofs. The recent trend, however, is to the pure silica brick known as super duty.

Although most open hearths have sprung silica port roofs, many of the new shops erected during and since 1951 have suspended basic port roofs. This innovation started during the last war and in many cases has reduced repair time and lowered over-all refractory cost by outlasting the sprung silica roofs.

The checkers consist of first quality fireclay brick topped with three courses of super duty brick. This again is a relatively new idea tried only in a few plants. The layer of dolomite spread over the slag pocket floor is a unique twist to the old problem of hard slag. This, in conjunction with the basic lining in the uptakes, and the basic port roofs, should practically eliminate any possible chance of hard slag formation. *From an article by J. L. Kirk, Supt. Masonry Dept., in Starlight, published by Lone Star Steel Co., Lone Star, Texas.*

## Holding Jig for Rings



**Holding jig for piston rings stepped up the output by 70 per cent for the English firm of Hepworth & Grandage. Rings are kept in alignment for operator who mills the gaps. (From Target, by British Information Services, N. Y.)**

# KIMBLE TOPLITE

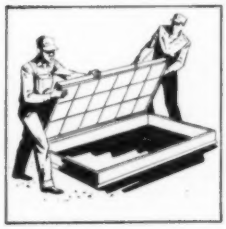
## *a new system for daylighting deep rooms*

New Kimble Toplite Panels solve the problem of how to provide daylight for deep interior areas too far removed from conventional, side-wall panels of prismatic Insulux Glass Block®.

This revolutionary new daylighting system lets you bring free daylight in from above through a simple framed, flat roof without monitor, saw tooth, or clerestory arrangements.

***Only the Kimble Toplite offers these features:***

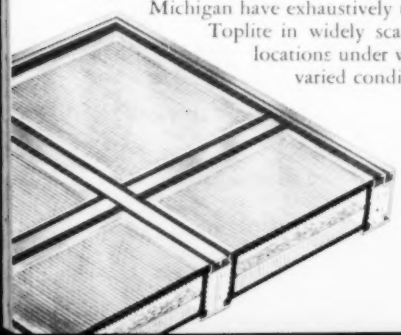
### PREFABRICATION

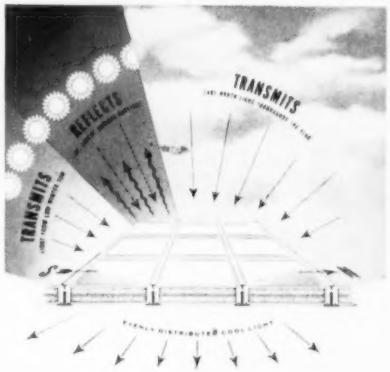


Kimble Toplite panels are factory-fabricated for uniform quality, and low installation cost. They are made up of an insulated aluminum grid into which special hollow glass units are set. The glass units are 10⅝″ square by 3″ thick, and are installed in the grid 12″ on centers. Panels are weatherproof with no porous materials exposed to the weather.

### TESTED, TIME-PROVED CONSTRUCTION

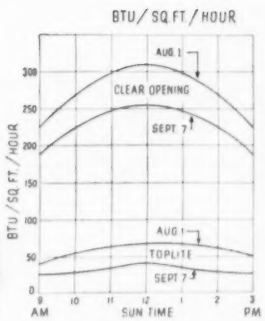
Kimble Glass Company, in conjunction with a leading roof light manufacturer, and the Daylighting Laboratory at the University of Michigan have exhaustively tested Toplite in widely scattered locations under widely varied conditions.






### SELECTIVE CONTROL OF DAYLIGHT

Kimble Toplite Panels are selective in their light transmission. They transmit a high percentage of the light from the low winter sun and from the north sky but reflect much of the direct light from the high summer sun. Light-controlling characteristics eliminate glare and distribute daylight evenly throughout the room.




**Calculated total heat gain through a Toplite Panel as compared to a clear opening in a horizontal roof for a building located at 37° N. Latitude.**

### SOLAR HEAT REDUCTION

Panels are designed to reflect hot summer sun and have unusual ability to reduce solar heat transmission. Toplite panels have high insulating value thus reducing troublesome condensation during winter. Loads on heating, air conditioning and artificial illumination systems are reduced.

### *More information*

Want more information about this great advance in daylighting? Send for the new, free bulletin: "Kimble Toplite—a new system in daylighting." Address: Insulux Glass Block Division, Kimble Glass Company, Dept. PE-6, Box 1035, Toledo 1, Ohio.

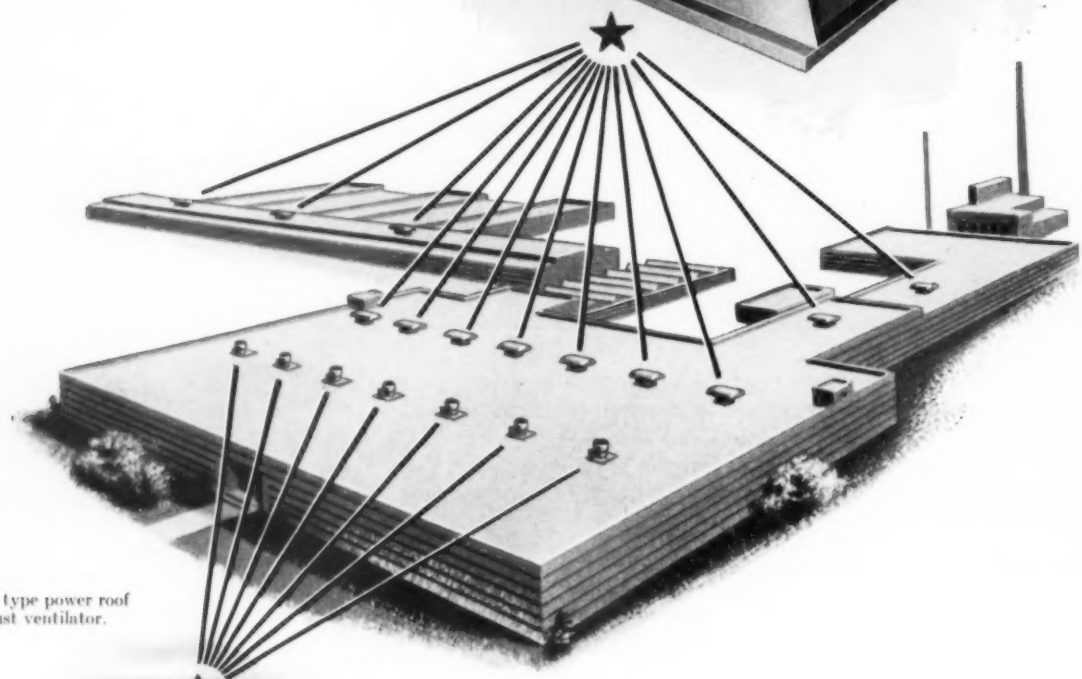
*MANUFACTURERS OF INSULUX GLASS BLOCK*

**KIMBLE GLASS COMPANY**

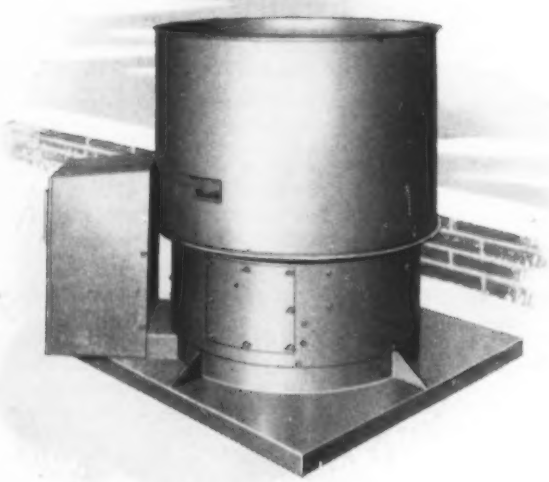
Toledo 1, Ohio—*Subsidiary of Owens-Illinois Glass Company*

# AMERICAN BLOWER
## Power
## Roof Ventilators

Hood type power roof exhaust or supply ventilator.



Upblast type power roof exhaust ventilator.



American Blower *power* roof ventilators give you the advantages of balanced ventilation, without the uncertainties of gravity units or the expense of a central system.

They're quickly and easily installed on all types of roofs. No extensive duct work is required; no valuable floor space is wasted. Use single units for spot ventilation; several units for large area coverage. American Blower power roof ventilators, supply or exhaust, are available in a wide range of capacities. They are designed to furnish balanced ventilation to industrial plants and commercial buildings.

Ask our nearest branch office for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

**AMERICAN BLOWER**

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

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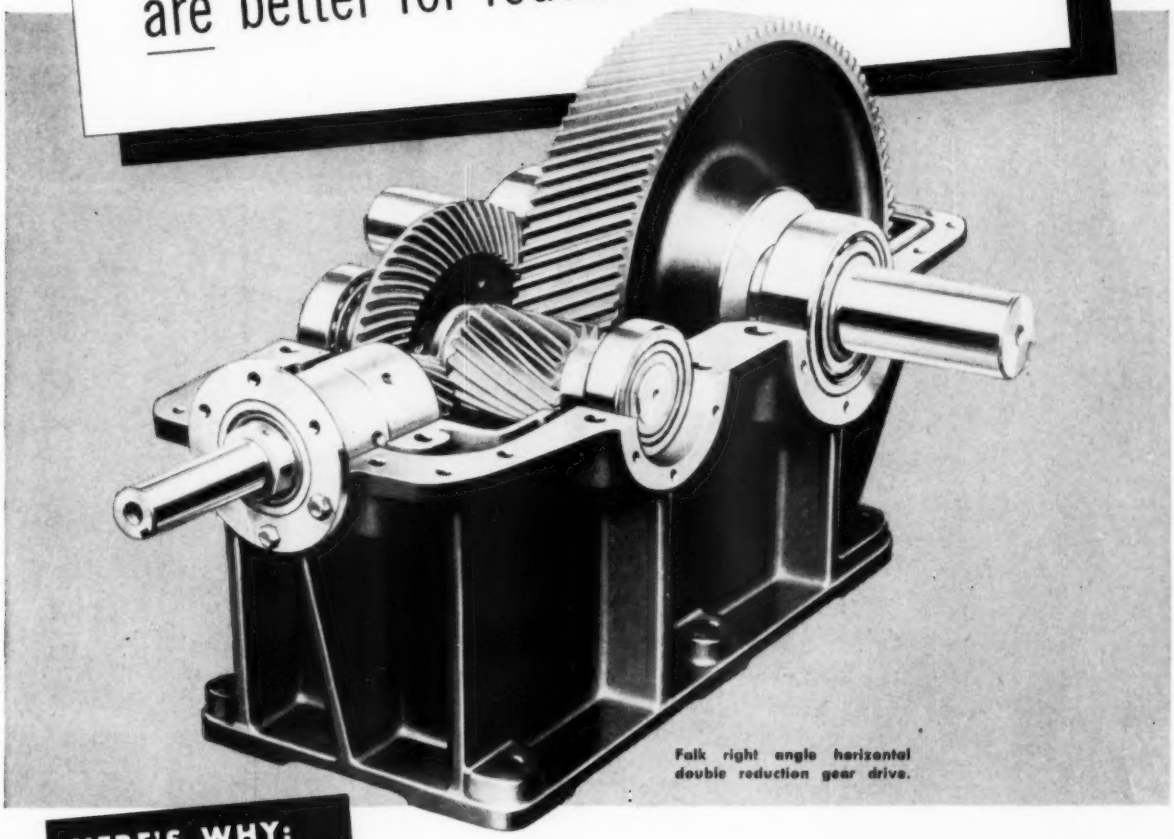
# Yes, GULF E.P. LUBRICANTS are better for reduction gear drives:



Falk right angle horizontal double reduction gear drive.

## HERE'S WHY:

1. **Good anti-weld properties**
2. **Noncorrosive**
3. **Extra tacky**
4. **Stable**
5. **Good rust preventive properties**

For cooler running gear drives, freedom from scoring caused by faulty lubrication, and for protection against corrosion, select Gulf E.P. Lubricants for your speed reducers and increasers.

Gulf E.P. Lubricants provide better tooth protection. And it is often practical to use a Gulf E.P. Lubricant of lower viscosity than is possible with a straight mineral oil, which may mean that fewer grades of gear lubricants are required.

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## reach for your Plant Engineering File

**These are some of the manufacturers' catalogs on mechanical equipment instantly available in your Plant Engineering File. They can be found in Sections 1b through 1g. They contain comprehensive information on vertical transportation, power transmission, pumps and compressors, plate construction (tanks), pipe fittings, strainers, valves and traps.**

The other sections of this File contain additional catalogs covering a wide range of materials and plant equipment . . . useful information on products used in the maintenance of all plant facilities and services to production.

This collection of 252 manufacturers' catalogs is grouped in sections according to products, or use of products, so that you can readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want, please tell us.

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**119 WEST 40TH STREET**
**NEW YORK 18, N. Y.**

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*Edited by H. E. B. Anderson*

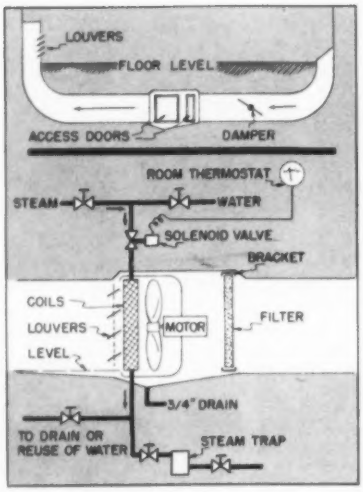
## Air Conditioning Small Offices

**Contributed by H. Nye Josleyn**

SATISFACTORY air conditioning for smaller isolated offices can be readily constructed with the use of materials found in most plants. Required are an ordinary fan type unit heater, standard room thermostat, a solenoid operated valve, a glass fiber air filter and material for making short air ducts. Installation may be, according to convenience, under the floor, over the ceiling, or along an outside wall.

A box is constructed to contain the finned coil, fan, and filter, with access doors on one side. The box and duct are best constructed of galvanized sheet metal, but ply wood can be used with roofing material covering on the inside lower surfaces of the discharge duct and box. The bottoms of the box and discharge duct are tapered to drain down under the coil to an open ¾ in. pipe drain, to remove moisture that will accumulate on the coil during warm humid weather. Slanting the unit heater louvers will stop most of the water blown out of the coil.

Heat is provided by opening the steam pipe and steam trap valves;




**Elevation (top) and a plan view of arrangement for under-floor installation**

cold is provided by closing the steam valves and opening the water and drain valves.

Temperature is controlled by a 60 to 120 F coil type room thermostat which operates a normally closed shut off solenoid valve in the inlet pipe to the coil. For summer operation reversing the mercury bulb in the thermostat will cause the solenoid valve to close when the room temperature lowers to the desired setting.

Reversing the mercury bulb is accomplished by removing the outer case of the thermostat, pulling the bulb from its clip, and reinserting, with the wires reversed.

An outer single layer of hair felt or one inch cork over the box and ducts is desirable to conserve temperatures.

## Flexible Contact Arm Takes a Beating—But Stops Charging Bucket

**Contributed by Howard T. Bailey**

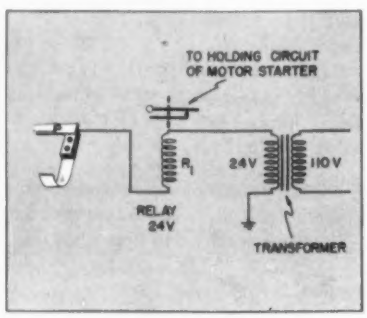
ON A CUPOLA charging conveyor installation, a standard limit switch was being subjected to dust, water, and frequent shocks when struck by falling iron. After considerable down time and switch repair, a system was devised to replace the limit switch, using parts less susceptible to breakage and mechanical failure.

The installation was made at the bottom of the 70 ft inclined bucket conveyor which carried the charge to the top of the cupola. Where the limit switch was formerly installed, a contact arm was mounted, insulated from the conveyor frame and ground.

As the cupola charging bucket returns to the loading position to be refilled, it strikes the contact arm, completes the circuit to ground and energizes the relay. The relay, in turn, breaks the holding circuit on the main contactor, and the conveyor drive motor stops.

The contact and relay operate at a potential of 24 v, and similar installations function as well at 6 v.

**Flexible contact arm installed at end of travel of 70 ft cupola conveyor**




**When grounded by cupola charging bucket, the contact completes circuit**

## Tungsten Carbide Mold Inserts

UNTIL QUITE recently, lengthy production runs in industrial plants were impeded, not by the materials used in fabricating the production equipment, but by the performance capabilities of the latter. One answer to this is the use of wear-resistant materials on vital equipment components.

At Carborundum Co. wear-resistant mold inserts of tungsten carbide are used in the production of silicon carbide and aluminum oxide grinding wheels. It has been found that the use of these inserts has provided an over-all average working life of about 10 times that of other engineering materials. One 4-inch mold on an automatic press was still in good condition after it had produced 86,000 pieces. The mold previously employed lost its efficiency after producing 2,500 pieces.

While the costs of these Carboloy tungsten carbide molds average three times that of steel, replacements are drastically reduced. Also, when the molds are worn, they can be resized for reuse.

## Rigging Tips for Metal Stacks

**Contributed by H. N. Josleyn**

SAFE RIGGING of tall smoke stacks for painting or other maintenance is not beyond the ability of regular plant maintenance men.

To rig a metal stack, circle the outside of the upper guy wires, near their base, with a ¾ in. rope. In one end of the rope, tie a running bowline 12 in. in diameter. Thread the running end of the rope through the bowline and pull it taut. As the running line is tightened, the bowline will ride up the guy wires to the top band of the stack. A single ½ in. rope fall attached to the bowline will thus be pulled up to the top stack band. The free end of the ¾ in. rope is securely fastened.

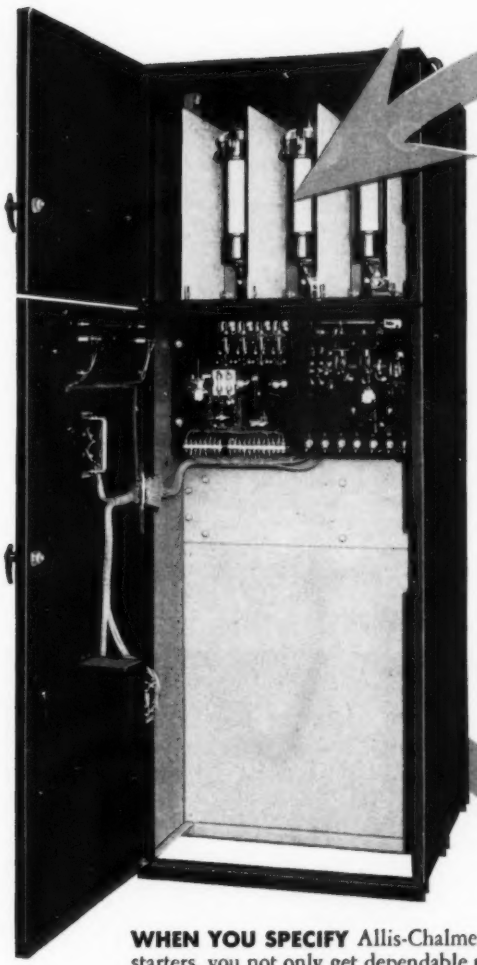
Fasten a bosun's chair to the rope

ALLIS-CHALMERS

## Type H Starters

FOR 2300 TO 5000 VOLT MOTORS

# Give YOU Full Protection



### SHORT CIRCUIT PROTECTION

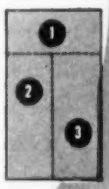
Current-limiting fuse clears short circuit in less than ½ cycle . . . long before the short has had time to harm contactor or motor. Blown fuse emits no gas, flame nor vapor, discharges no metal. Flashover caused by ionized vapor is eliminated.

### OVERLOAD PROTECTION

Type 194 thermal overload relay automatically adjusts for ambient temperatures — trips only on motor overload. Prevents unnecessary motor outages. Allows use of maximum capacity, but prevents dangerous motor overloads. Can be adjusted to plus or minus 20% of rated current.

### PERSONNEL PROTECTION

The steel cubicle is divided into three compartments for maximum personnel protection. 1 — Upper front compartment encloses disconnect type fuses. 2 — Lower front compartment houses low voltage control devices. 3 — Rear compartment contains high voltage equipment, contactors, buses, intrument transformers, etc.




Side View of Cubicle

### TIME DELAY UNDERVOLTAGE PROTECTION

Should an undervoltage occur, the line contactor opens. During a predetermined period, relay remains closed to permit restarting of motors when power is restored.

**WHEN YOU SPECIFY** Allis-Chalmers Type H starters, you not only get dependable motor control, but you are assured of an all-important "plus"— FULL PROTECTION for man, motor and machine. Positive protection as engineered into Type H starters permits men to work in complete safety... protects motors and machines from costly damage . . . lengthens equipment life . . . increases production by reducing downtime. Get all the facts from your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3982

# ALLIS-CHALMERS

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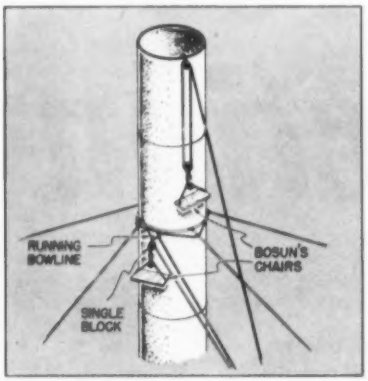
# OPERATION AND PRODUCTION

(O and P begins on page 52)




**Preliminary (left) and final (right) positions of bosun's chair in rigging**

running through the single ½ in. block. On this chair, the rigger can be pulled up to the top stack band, in position to complete the rigging.

Fastened to the chair and raised with it are a notched length of ¾ in. pipe, a safety loop and a double rope fall. The pipe is split on one end, to hold the top hook of the double rope fall. Placing the hook in the split, the hook can be pushed up to the top of the stack, where it can be hung over the stack rim. Using the safety loop for support, the bosun's chair is transferred to the double rope fall, and the rigger is ready to inspect, paint or repair as necessary, with suitable support from the stack top rim.

## Pump Timer Measures Liquid Flow

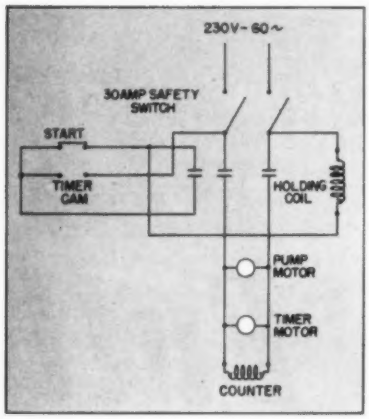
**Contributed by G. D. Cook**

THE CONVERSION from individual drum storage to bulk storage of degreasing fluid has recently been completed at the E. F. Hauserman Co., Cleveland, Ohio.

For inventory control of the liquid, trichlorethylene, and in order to detect underground system leaks, metering of solvent usage was desired. To minimize the cost of original equipment, the use of a constant pressure, constant time flow system was chosen in lieu of the installation of a costly flow meter. Inasmuch as the solvent requirements at the degreaser amounted to evaporation makeup only, this metering system was both feasible and practical.

A standard rotary vane type pump was used, with a by-pass valve in the discharge. With a normally-closed gate valve between the pump and the degreaser, when the pump is started, the by-pass valve opens only when the preset pressure exists in the system. When this valve opens, flow at constant pressure is maintained as long as the pump runs.

To control the flow, a synchronous timing device, set for three minute intervals, was inserted into the holding circuit of the pump motor starter. This timer provides a preset pumping time, and an electric counter records pump cycles. With the discharge of one pumping cycle accurately measured, solvent usage for any period of time is quite easily calculated.




**Wiring diagram for timer control, pump and counter on metering system**

A safety switch at the degreaser site provides quick shutoff of the pump, in the event of a timer failure.

Comparison of the metered flow with the depth gage variation in the storage tank provides a means of checking solvent usage against purchases.

## Funnel Improves Granular Flow

**Contributed by J. E. Nissley**

AS A TEMPORARY remedy each time that granular material failed to flow from a storage hopper, considerable time and effort was being spent in hammering the sides of the hopper to start the flow.

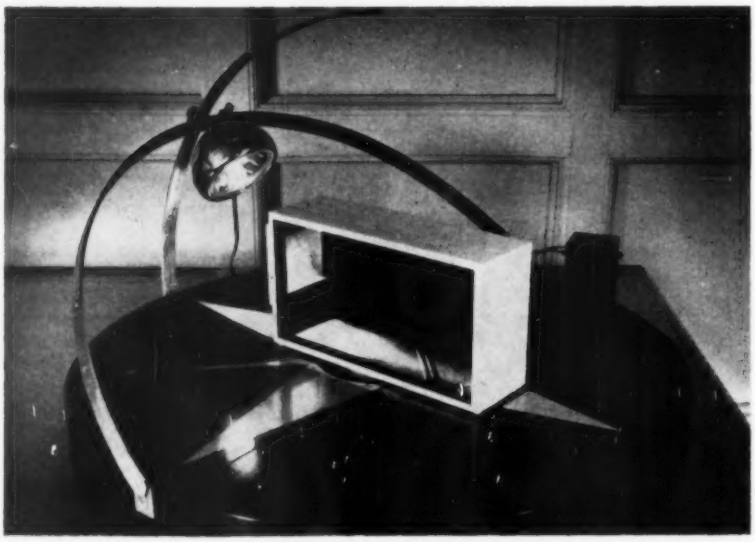
To offset the arching of the material over the hopper discharge, an

## Portable Model Simulates Sun's Rays to Solve Numerous Lighting Problems

A PORTABLE demonstration unit, in use by the Mississippi Glass Co. of St. Louis, Mo., provides a visual demonstration of the effects of the sun's position at any given time on industrial lighting.

It consists of a spotlight, mounted at the junction of two arcs, so as to shine through various samples of glass and illuminate a model room. It illustrates the extent of diffusion of various types of glass and shows how diffusion becomes a factor in obtaining usable daylighting from various types of fenestration.

The spotlight is used as a parallel light source, as is the sun itself. By means of the two arcs, it is possible to simulate the altitude and azimuth for the various hours of the day. The apparatus facilitates setting up a building model with any orientation of a designated latitude at a specific time of the year and in a manner which will demonstrate the lighting angle in a selected city, on a typical day.



**Portable, folding "solar system" shows light diffusion through glass block sample**

3 ERIE CITY "V-C"
STEAM GENERATORS,
27,000 LBS. PER HOUR EACH,
FIRED BY OIL AND GAS IN A
WESTERN STATE CAPITAL BUILDING
ERIE CITY IRON WORKS

# the Erie City "VC"

## A 2-DRUM Steam Generator with complete furnace cooling

A 50 year experience with 2-drum boilers is reflected in this modern design. Today's ERIE CITY "VC" incorporates scores of design, manufacturing and installation improvements. The Erie City "VC", as described in our latest catalog, offers high capacity in a compact design which saves space — lowers installation and maintenance costs and assures good operating characteristics with a wide choice of fuels and firing methods. New Catalog **VC-3** describes the Erie City modern 2-drum Steam Generator in detail.

*You can depend on Erie City for sound engineering*

ERIE CITY
112 Years in Steam Generation

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STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS

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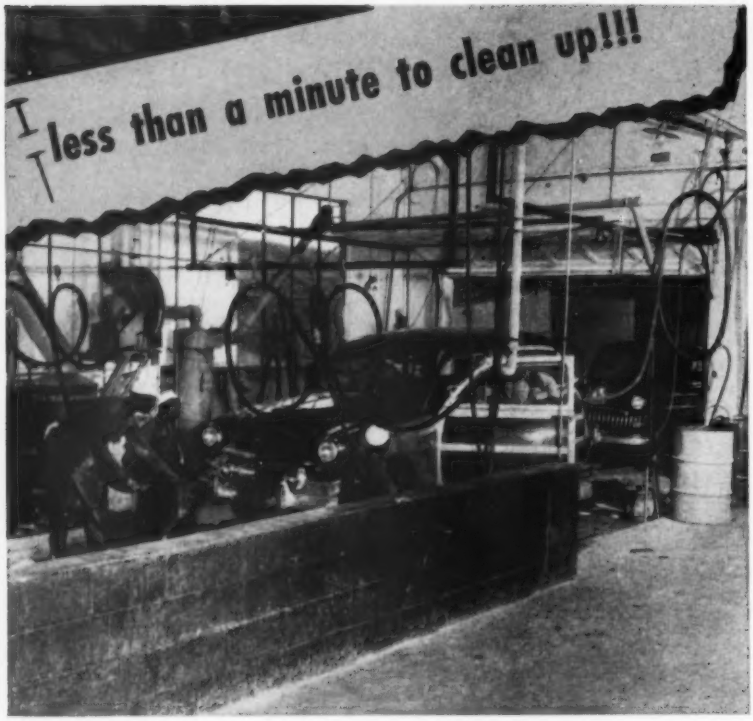


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**REPUBLIC HOSE**

Here's a job that once took half a day. Now, with the help of Republic Rubber Hose, automatic car washers do the work in less than a minute. It's a triumph of specialization! Your car moves down a conveyor line. Republic Steam Hose blasts the road grime off the wheels. Almost simultaneously, the car is wetted down for soaping and then the rinse, with Republic Water Hose. Vacuum Hose sucks dirt out of the car interior. Your car is dried and ready to go.

You, too, can "clean up" with Republic. Just as Republic furnished the **right** hose to help cut car washing time to minutes, they've furnished cost-cutting belting, hose, packing and molded items to every industry . . . undoubtedly to **your industry.**

Your local Republic Distributor can help you plan, select, apply and maintain any product of Industrial Rubber. If he is not listed in the yellow section of your telephone directory, write us for his name and address.

**REPUBLIC RUBBER DIVISION**

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INDUSTRIAL RUBBER PRODUCTS

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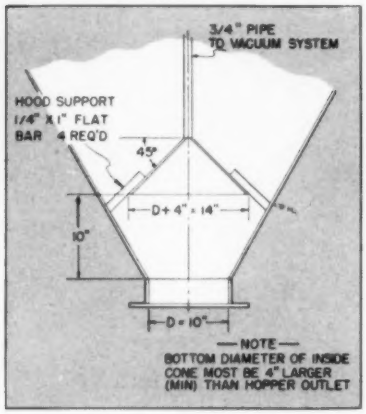
# OPERATION AND PRODUCTION

(O and P begins on page 52)

inverted funnel, with a diameter 4 in. larger than that of the opening, was installed over the opening.

The cone of the funnel was connected through a ¾ in. pipe to the dust collector system of the plant, so that a slight vacuum was maintained above the discharge. In operation, the funnel has been effective in preventing the formation of an air lock at the discharge, and arching of the material has been eliminated. As a result, material flow through the hopper discharge to the filling machine has been greatly improved.


3/4" PIPE TO VACUUM SYSTEM
HOOD SUPPORT 1/4" X 1" FLAT BAR 4 REQ'D
45°
D+4" x 14"
10"
D = 10"
— NOTE —
BOTTOM DIAMETER OF INSIDE CONE MUST BE 4" LARGER (MIN) THAN HOPPER OUTLET

**Discharge opening of granular material hopper, showing position of the funnel**

## Maintenance of Flat Belts

INCORRECT ALIGNMENT of pulleys and belts, vibration, slippage and slackness, and surrounding dust and dirt are causes of flat belt trouble. Some of the undesirable conditions and subsequent troubles are as follows:

**Belts Pulling the Wrong Way.** Whenever practicable, belts should be so installed that the slack side is on top of the pulleys, to give the maximum arc of contact between pulleys and belts.

**Slipping Belts.** To obtain the best live gripping effect from belt drives, run the belts with the least tension required to transmit the maximum load without slipping. This will aid in increasing the arc of contact and reduce the tendency to slip. However, belt slippage caused by running the belts too loosely must be avoided. A belt with too much slack will not only slip but also will glaze, burn, crack and peel.

**Glazed Belts.** Belts will become glazed or have dry surfaces if operated over crowns which are too high.

**Misalignment of Pulleys.** Correct

(Continued on page 59)

telling the story of 'dag' dispersions

# If You Have Trouble With High-Temperature Lubrication...

Try *dry-film* lubrication . . . try **'dag'** colloidal graphite.

This unique material is not ordinary powdered graphite. It is high-purity, electric-furnace graphite, specially treated by Acheson Colloids to produce particles many, many times finer than those of graphite powder. Dispersed in a variety of liquid carriers — water, oils, volatile hydrocarbons, resin-solvent combinations — **'dag'** colloidal graphite goes where it should, and gets down to work.

**'dag'** dispersions — applied by spraying, brushing, or dipping — give you slick, durable, dry lubricating films. They won't gum up or break down at any temperature you are likely to run into because graphite is wholly unaffected by heat up to 750°F. . . . largely effective at even higher temperatures.

Try **'dag'** colloidal graphite for conveyor lubrication, for bearings, for moving parts subject to degreasing action, for anything that must move at high temperatures.

Details are available in Bulletins No. 424-22F and No. 435-22F.

*Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.*

dag DISPERSIONS

**Acheson Colloids Company,** Port Huron, Mich.

... also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

Units of Acheson Industries, Inc.

try 'dag' resin-bonded dry films for permanent lubrication

# P&H OVERHEAD CRANES

## Why P&H builds the entire Crane

### . . . including electrical equipment!

If you want the utmost in service from your cranes, insist that they be job *engineered* by P&H — not an assembly of components from various sources. For example, general purpose electric motors don't stand the gaff of crane service like those *designed* for the job. That's why P&H builds its own motors, brakes and controls — with all characteristics *properly suited* to crane operation: P&H electrical equipment throughout is your assurance that all functions are perfectly coordinated. It means better service, less maintenance.

This policy of complete quality control — of single manufacturing responsibility — better service — made P&H the leading builder of overhead traveling cranes. Continuous improvement, far ahead of the field, has extended this leadership. Benefit by it when you buy your next cranes.

*T.M. of Harnischfeger Corporation for electromagnetic type brake.

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**HARNISCHFEGER CORPORATION**

Milwaukee 46, Wisconsin

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# OPERATION AND PRODUCTION

(O and P begins on page 52)

alignment is essential for good performance. Check with a string on both edges of the pulleys and recheck after giving the pulleys a half turn. Place pulleys as close to the hangers as possible to prevent sprung shafting on heavy loads.

**Crooked Belts.** Belts will run crooked if stretched unduly on one side or if the ends are not joined squarely. Also, if the pulleys are misaligned, the belts will try to run up on the flanges or the steps of cone pulleys.

**Undue Wear on Belt Edges.** This can be prevented by a periodic check on belt guards, guides, shifters, and pulley flanges, which, if they are misaligned, will result in distorted, damaged belting. When belts run in quarter-turn drives, it is best to give the belt a half turn before splicing, to spread wear more evenly.

**Dirty Belts.** Avoid the use of wire brushes when cleaning dirty belts. A fibre brush or a soft rubber strip will remove accumulations without injury to the belt surfaces. Keep belts clean with belt dressing.

**Tendency of Belt Lap To Open.** To check this tendency, face the outside feather edge of a cemented lap in the direction opposite to belt run. This will keep the edge of the joint from being lifted up by air currents.

**Replacing an Old Belt.** Do not depend on the measured length of the old belt but use a steel tape around the pulleys. To do this properly to motors with adjustable bases, the motors should be moved up to about three-fourths of their closest adjustment before measuring.

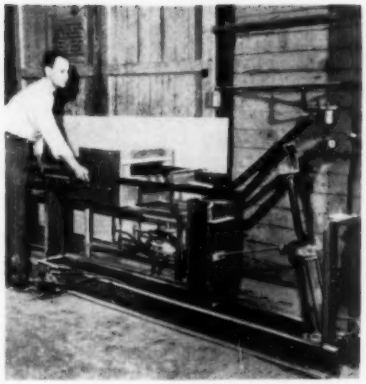
**Belt Storage.** All belts, both flat and V-type, should be stored in a dark, cool place, in an atmosphere which has little steam or moisture. Otherwise V-belts may get stiff and crack, or the cemented flat belts may separate in the joints.

## Air-Powered Pipe Bender

A NEW MACHINE, operated by an air cylinder, is in use at Barrows Porcelain Enamel Co., Cincinnati. Specially designed for use in the production of glass lined steel pipe, it bends a length of "flux" pipe to a 45 deg angle, after the pipe has been glass-coated inside and out.

Prior to bending, the pipe is spot heated to 1500 F in a small furnace positioned next to the bending machine. The pipe can be handled without special protection immediately after heating, for insertion into the bending jig.

The machine is operated by one man, who positions the pipe in the



Pipe bender, constructed of channel and angle iron, uses air-cylinder power

frame, and starts the bending by treading on a foot pedal, as he holds the pipe in proper alignment.

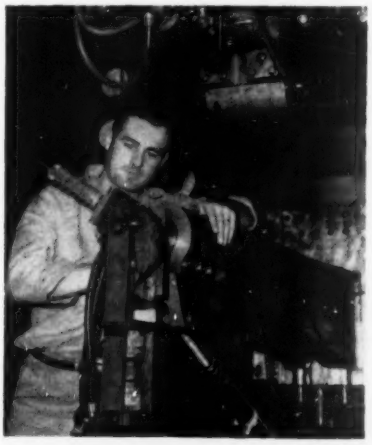
## Spot Welder "Opens Its Jaws"

A ROTATABLE ELECTRODE, conceived as an accessory for large spot welding machines, speeds production of huge external wing tanks at Ryan Aeronautical Co., San Diego.

Largest ever designed, the wing tanks are of spot welded aluminum alloy construction. To handle them, Ryan has installed tracked conveyor systems to eight large spot welding machines.

By making the lower electrodes of the welders rotatable, one man can push the tank sections between the 60 in. jaws of the machines with ease. Formerly, four men were required to lift the tanks during the welding cycle.

Operated by foot control, the rotatable electrode swings to a horizontal position to provide 10 in. of added clearance between the electrode arms. A hydraulic cylinder pulls a yoke, keyed into an L-shaped slot in the lower electrode assembly. The copper electrode is mounted on



Hydraulic controls rotate the lower electrodes of the spot welding machine


P&H ELECTRIC HOISTS

Imagine!
A P&H
ZIP-LIFT
AT THIS
NEW
LOW PRICE

ONLY
$199.50
1-ton capacity

A real wire rope hoist!

Of course you prefer the Zip-Lift! With all its quality features, who wouldn't! But if higher cost has stopped you, here's good news. It is now available with improved rope control (one pendant, *not two*), for simple, easy, trouble-free operation — for only $199.50. It is the same Zip-Lift in other respects — same quality — new type control. *What a buy!*

*Call your Zip-Lift Dealer*
*Or write us for Bulletin H-29*

Available also with full electric push-button control.

Other models up to 15-tons capacity

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Milwaukee 46, Wis.

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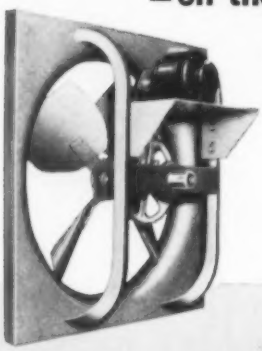
# High-Performance Blades!

**—on these world-famous helicopters**

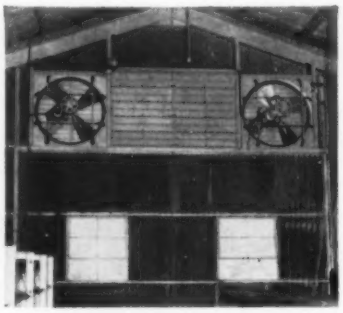


**and the "Buffalo" FANS in their plant**

• Out of the heat treat building of the Piasecki Helicopter Corporation in Morton, Pa., come precision-made parts like the rotor blades raising this big, new Piasecki H-21 "Work Horse" Helicopter.

Doing another "Work Horse" job in that building are other blades — the wheels of the "Buffalo" Heavy Duty Belt-Air fans constantly exhausting the hot air from the process. In these blades, as in helicopter blades, balance must be perfect for freedom from vibration. Blade shape must be for high efficiency, that is, most delivery on least power. Overall construction must be extremely rigid and strong "Buffalo" Belt-Air fans fulfill these conditions to perfection.

If you have an air moving job from 4,000 cfm to 50,000 cfm and up to 1" pressure, your best and lowest cost solution may well be one of these rugged propeller fans. Why not write for literature today?



First For Fans

**BUFFALO FORGE COMPANY**

166 MORTIMER ST. BUFFALO, NEW YORK

*PUBLISHERS OF "FAN ENGINEERING" HANDBOOK*

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Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

**For more facts circle 547 on Reply Card**


# OPERATION AND PRODUCTION

(O and P begins on page 52)

a horizontal shaft which is attached to the electrode arm. As the yoke descends, it rotates the electrode into a horizontal position.

In addition, wedging action incorporated into the yoke pushes it tightly against the electrode arm to form a firm electrical contact, as the electrode moves into the upright position to make a weld.

The assembly operates on the same line water pressure used for cooling the electrodes, boosted to 400 psi by the hydraulic cylinder.

## Smooth Ride for Hoist Trolley

DIFFICULTY is sometimes experienced with overhead hoists used in handling materials around machines. The load has a tendency to swing as it is moved, and may swing into the machine, damaging both the load and the machine.

The installation of double trolleys, employing casters as trolley guides, has improved this situation at the

**Hoist mounted on double trolley. Casters keep trolley legs centered on rails**

Faultless Caster Co., Evansville, Indiana. The casters keep the trolleys riding squarely and smoothly on the rails, and the load swing formerly experienced has been decreased to a satisfactory level.

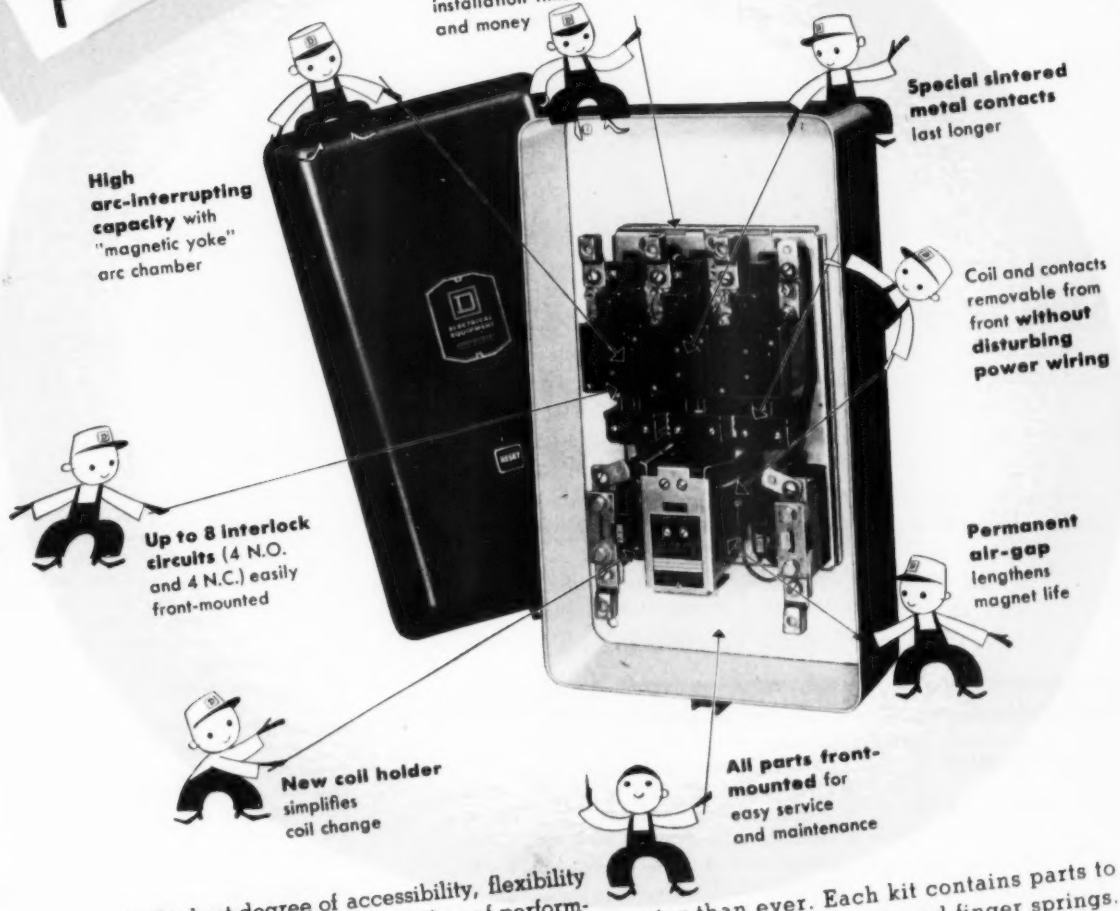
## Top-of-the-Ladder Bulb Rack

ONE DIFFICULT PROBLEM facing the man doing lighting maintenance is the handling of the bulb which he has removed from an overhead socket while he is cleaning the reflector. His difficulties are increased further when he has to replace a burned-out bulb, and has two bulbs to handle, while standing on top of a ladder.

Light bulbs can be located in an

# NEW Square D Size 4 Starter

*Feature-packed!*


"Hook-on" base design saves installation time and money
Special sintered metal contacts last longer
High arc-interrupting capacity with "magnetic yoke" arc chamber
Coil and contacts removable from front without disturbing power wiring
Up to 8 interlock circuits (4 N.O. and 4 N.C.) easily front-mounted
Permanent air-gap lengthens magnet life
New coil holder simplifies coil change
All parts front-mounted for easy service and maintenance

The highest degree of accessibility, flexibility and compactness—with no sacrifice of performance and long life. That's Square D balanced design—and you'll find it in every size Square D starter.

"Off-the-Shelf" Parts Kits, another Square D convenience feature, make normal maintenance easier than ever. Each kit contains parts to replace all load contacts and finger springs. Electrical interlocks also available in kit form.

*Write* for Bulletin 8536, Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

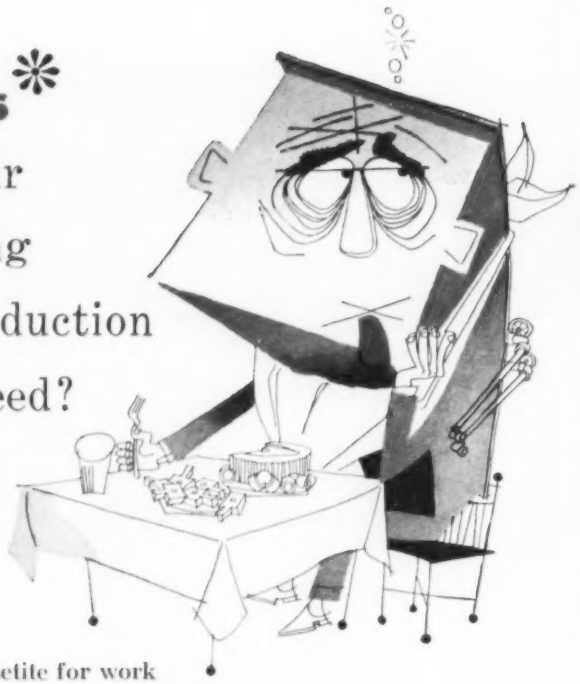
SQUARE D COMPANY

1903 • 50 YEARS OF DESIGN LEADERSHIP • 1953

does

**coil-itis** ✻

have your processing tank production off its feed?



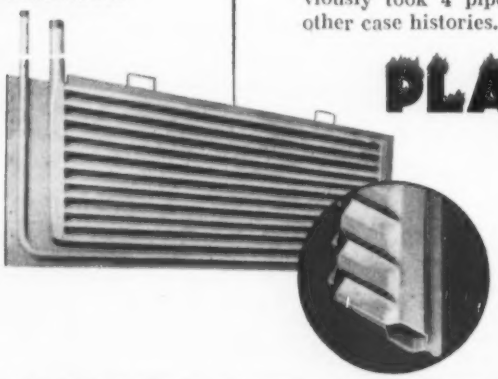
When the appetite for work of your heating and cooling processes diminishes, the trouble may well be coil-itis. For, downtime due to pipe failures and limitations can seriously delay your production flow. Switch to Platecoils, the new tonic for production, as revolutionary as the new wonder drugs. Platecoils take 50% less tank space leaving more room for greater payload. They heat or cool 50% faster. They simplify maintenance and save hours of downtime. Equally important, Platecoils cost as much as 50% less in the first place. Platecoils cure production troubles involving heat transfer and give production a shot in the arm.

**Write for Bulletin P80 today!**

**PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS**

**PLATECOILS ELIMINATE A 6-TO-8 HOUR-A-DAY CHIPPING JOB**

At Sealed Power Corp., installation of Platecoils has completely eliminated a 6-to-8 hour-a-day chipping job. Three Platecoils now heat a tank that previously took 4 pipe coils. Ask about other case histories.



**PLATECOIL**

**REPLACES PIPE COILS**

✻

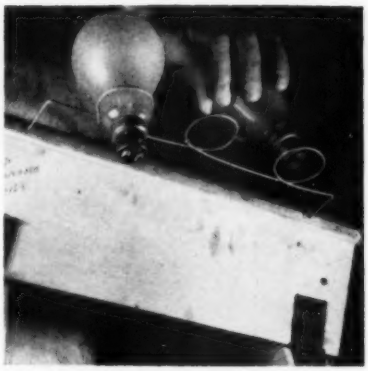
Coil-itis — Diagnosed as tank heating and cooling problems. Platecoils — the prescription for solving pipe coil problems.

**PLATECOIL DIVISION, KOLD-HOLD MANUFACTURING CO., LANSING 4, MICHIGAN**

**For more facts circle 549 on Reply Card**

# OPERATION AND PRODUCTION

(O and P begins on page 52)



**Wire rack simplifies handling of bulbs during changes and reflector cleanings**

accessible position at the top of the ladder by making a simple wire rack for them and fitting it to the top of the ladder. The rack consists of steel wire bent to form three loops large enough to accommodate the largest bulb involved. Each end of the wire is bent to a right angle, and pushed into a hole drilled in the edge of the top ladder step.

## Hand-Operated Suction Lift

To ELIMINATE the need for an extra burring operation, Temco Aircraft Corp., Dallas, follows the practice of performing punch press operations on routed parts prior to burring. Operators, however, had experienced difficulty in handling such parts, due to sharp burrs and router coolant oil residue, with minor cuts and broken fingernails a constant result.

One operator found a simple solution to the problem by attaching a small suction cup to a ring, and slipping the ring over one of his fingers. The cup does the work of handling the relatively large parts and the operator's fingers are not exposed.

**Operator lifts in-process part. Suction cup prevents fingers from being cut**

# this is GLASS

## The TIME-TESTED MATERIAL

- **It is non-combustible . . . won't burn.**
- **It is rigid . . . doesn't sag or warp.**
- **It has a permanently hard, impervious surface, not affected by time, abrasion or exposure to the elements.**
- **It won't corrode or stain.**
- **It resists chemicals—acids, solvents, etc.**
- **It retains its original clarity, brilliance and lustrous beauty.**
- **It is easily installed, maintained and cleaned by conventional methods.**

The traditionally-preferred material for window and skylight glazing, glass, and glass alone, gives you the proven performance you need for better daylighting at ultimately the lowest cost.

Send for free catalog,
"ABC's of ROLLED GLASS"
Samples on request.

## There is no Substitute for GLASS!

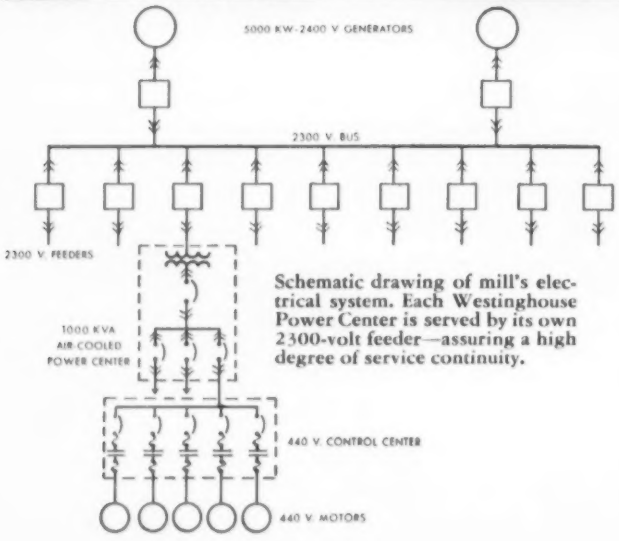
**MISSISSIPPI Glass COMPANY**

88 ANGELICA ST. SAINT LOUIS 7, MO.

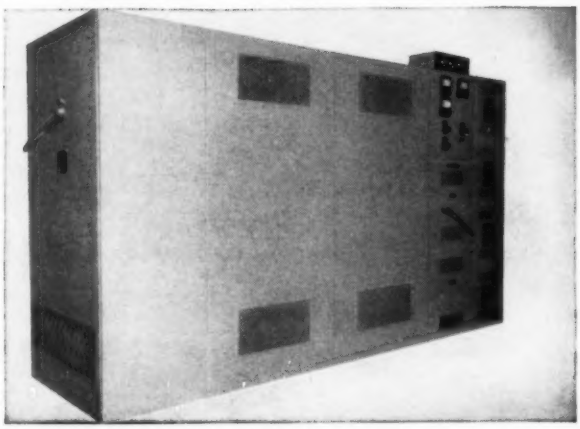
NEW YORK • CHICAGO • FULLERTON, CALIF.

WORLD'S LARGEST MANUFACTURER OF ROLLED FIGURED AND WIRED GLASS

**For more facts circle 550 on Reply Card**




Schematic drawing of mill's electrical system. Each Westinghouse Power Center is served by its own 2300-volt feeder—assuring a high degree of service continuity.



Westinghouse 1000-kva Air-Cooled Power Center, 2300/440 volts, is factory assembled as a complete unit. Rating can be increased 25 percent by adding forced ventilation.

# Get reliable, low-cost power by bringing high voltage close to loads

Men responsible for plant engineering functions will be interested in how St. Regis Paper Company provided reliable, low-cost electrical service in their new Pensacola mill. Round-the-clock production schedules had to be maintained—365 days a year. Power failures would work extreme hardship.

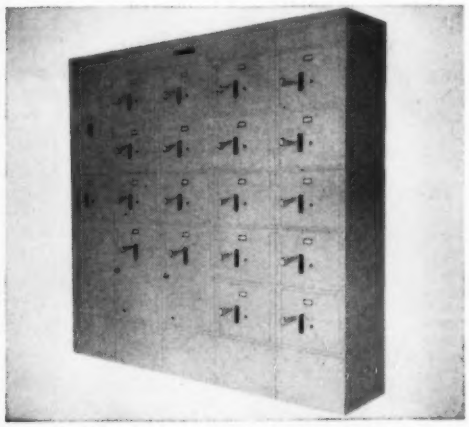
Called during the blueprint stage, Westinghouse helped the mill's engineers plan a modern radial distribution system. It is so designed that each power center is served by its own primary feeder. Thus, feeder and transformer faults are isolated quickly to the services of a single power center. A higher degree of service continuity is assured.

Westinghouse unitized equipment—pre-assembled and tested—helped keep power distribution costs to a minimum. Long runs of heavy, 440-volt feeders were eliminated. Feeder loss was cut. Wiring and conduit were greatly reduced.

Further, maintenance problems were simplified, since breakers and controls are easily accessible . . . and parts are standardized and interchangeable.

**CONSIDER THIS:** It takes *sound planning* and *co-ordinated equipment* to provide modern distribution systems, capable of meeting your plant power needs today and in the years ahead. Westinghouse offers you both . . . and backs them with years of experience, gained throughout all industry.

A call to your nearest Westinghouse office will bring an application engineer, well qualified to go over your distribution problems with you and your engineers. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94956



Starters are grouped in self-standing Westinghouse 440-volt Control Centers—factory assembled and wired with terminal boards. This simplifies installation and maintenance.

YOU CAN BE **SURE**...IF IT'S

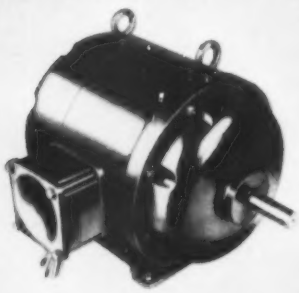
**Westinghouse**

For more facts circle 551 on Reply Card

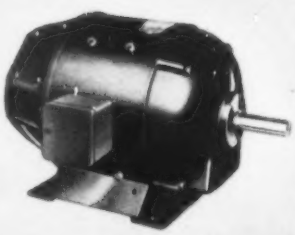
R & M "All-Weather" Polyphase Motors, 1 to 125 h.p.

# A COMPLETE LINE - 1 to 125 HP.

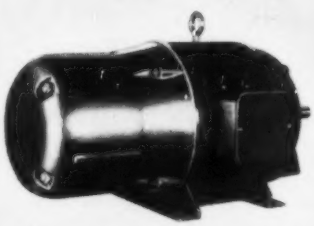
Explosion-Proof, Totally-Enclosed Fan-Cooled, and Chemical Plant Motors, 1 to 40 h.p.



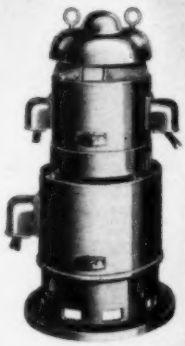
Direct Current, 1 to 7½ h.p.



Capacitor Single Phase, 1 to 7½ h.p.



Frequency Converters 2½ to 15 K.W.



***Because you can forget about periodic maintenance— and throw away your grease gun—you'll find that***

# Big, sealed bearings on R&M motors save you trouble and money!

One of the quickest ways to buy a motor you can install —and *forget*—is to be particular about *bearings.* That's why the extra-large, extra-wide, factory-lubricated and sealed bearings in R & M "All-Weather"* Motors are so important.

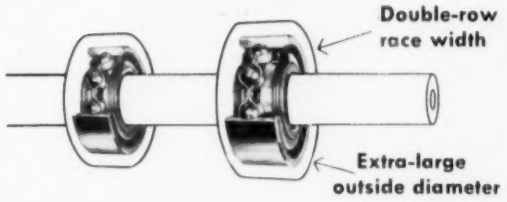
These bearings are much larger than you would normally expect to find. Being larger, they have more and larger balls—withstand more thrust.

And, because they're factory-lubricated and sealed, your grease gun becomes obsolete! That in itself eliminates a good many problems: the danger of introducing dirt and grit into the bearing, under-lubrication, and, equally harmful to motors, *over-lubrication.* Just an inspection once every 5 years or so...that's all that bearings in R & M "All-Weather" Motors need!

Bearings, of course, are only part of the story on the many outstanding features you'll find in R & M "All-Weather" Motors. A few others are shown below. Taken together, they mean *better* motor performance at *lower costs.* If that's the performance you want in your plant or product, use the coupon at right. *It will pay you to get complete information!*

*"All-Weather" is the trademark of Robbins & Myers, Inc.

## LOOK AT THE DIFFERENCE!




**The usual motor bearing and an R & M bearing have been mounted on the same shaft . . . you can SEE the difference!**

**ROBBINS & MYERS, INC., MOTOR DIVISION** PE-53
**Springfield 99, Ohio**

Please send me, without obligation, complete information on R&M "All-Weather" Motors—up to 125 HP.

*Name*_____ *Title*_____

*Company*_____

*Street*_____

*City and State*_____

*Product we manufacture:*_____

**R & M MAKES THEM ALL!**

**Explosion-Proof; Totally Enclosed; Single Phase; Direct Current;**

*If it's an* **R&M** *it's the Right Motor!*

**Motor Generators; Frequency Converters; Chemical Plant Motors; Close-Coupled Pump Motors; Jet Pump Motors; Motor Parts.**

# ROBBINS & MYERS, INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

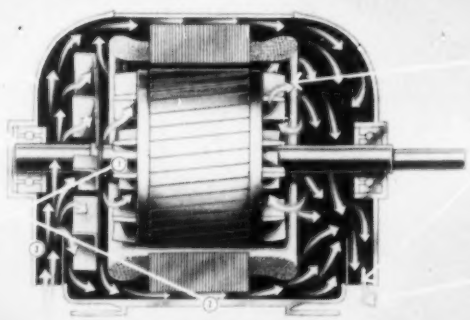
Fractional & Integral h.p. Motors & Generators | Electric Fans | Electric & Hand Hoists & Cranes | Moyno Pumps | Propellair Industrial Ventilating Equipment

## ALL THESE FEATURES...at a standard motor price!

**Shielded against moisture and damage** . . . by heavy, full-height shrouded end-heads.

**Extra-large ball bearings** . . . Sealed to keep grease in, dirt out.

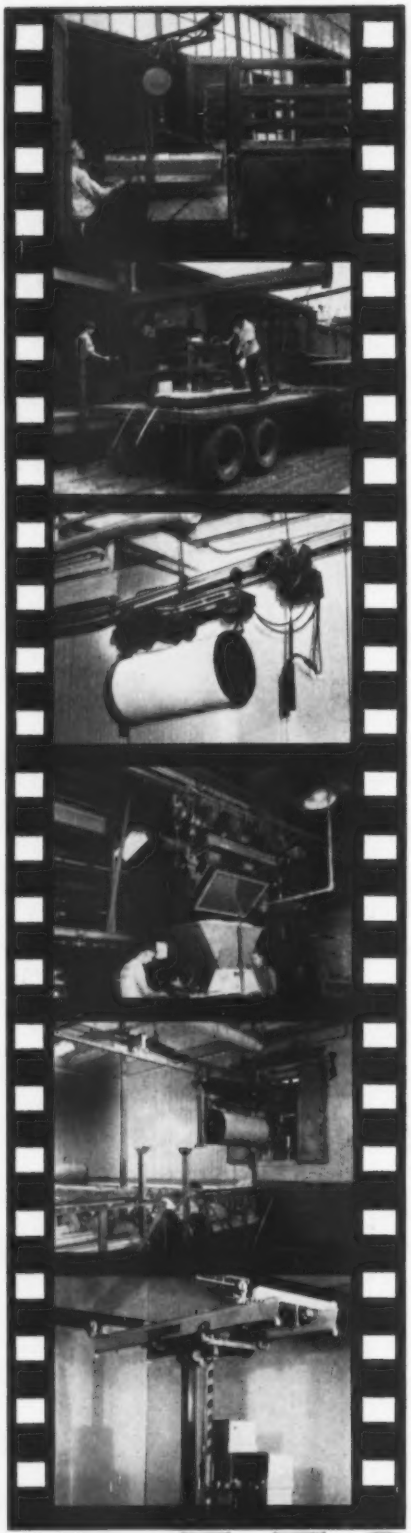
**Completely "Weatherized"** . . . rust inhibitor protects rotor (1) against damage; steel parts (2) have baked-on undercoating; cast-iron parts (3) get anti-corrosion treatment. Terminal boxes are gasketed; lead-ins are sealed.



**Insulated Coil Ends** . . . R & M insulates all *coils,* as well as phase *groups,* for 3 to 4 times greater insulating value!

**Sealed against rodents and debris**—openings are screened.

**"Clean-Sweep" Ventilation**—R & M Motors stay cool and stay clean; arrows show how high velocity air flow stops build-up of dust and dirt.



Quickly removes die blocks from trucks

Saves $30 each truck unloaded

Delivers beams to another building

Automatic delivery of core sand

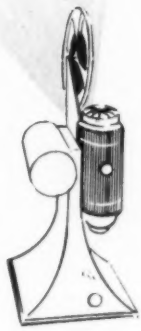
Automatic transfer of slasher beams

Stacker crane increases storage by 60%

The American MonoRail Co. PRESENTS

UP AND OVER

## a 16 mm movie that discusses handling problems common to every industry

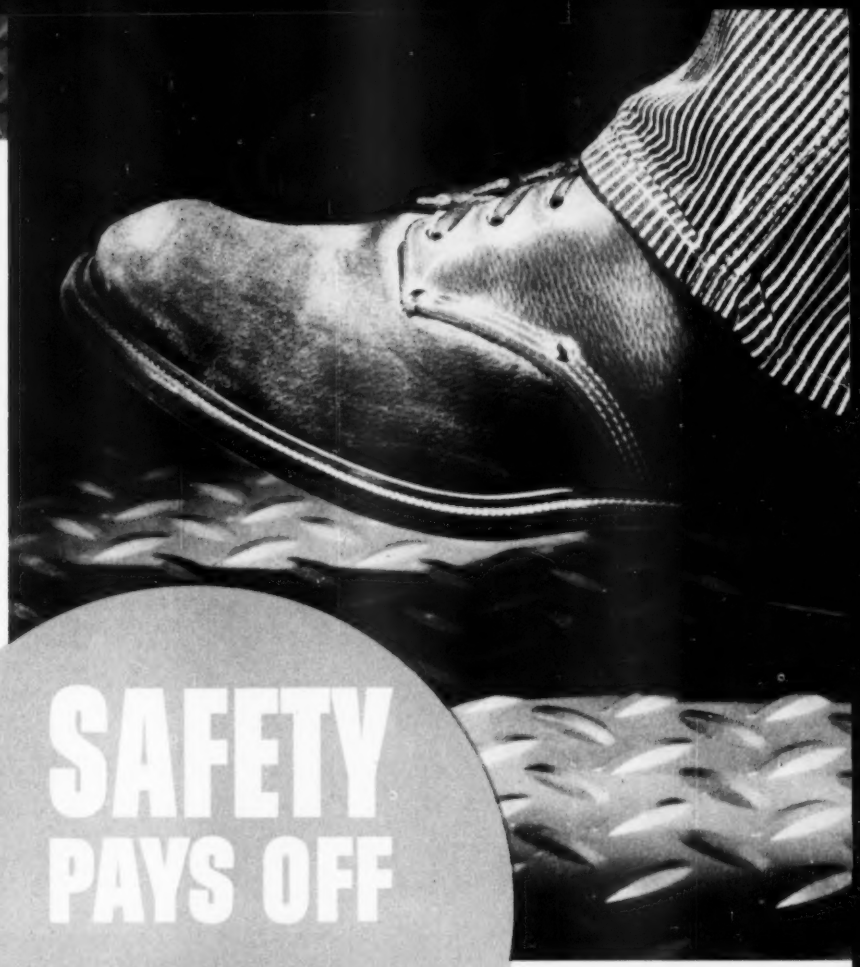


Before you decide upon any material handling equipment, let us loan you "Up and Over". This 16 mm film shows many installations of American MonoRail overhead handling equipment. You will see hand operated to fully automatic systems—one or more that may be particularly adaptable to your operations. The film is educational, interesting, informative and shows the way to economical, safe and time-saving material handling. Your ticket of admission is only a note to us asking for a print. It will help us if you advise the exact date, as close as possible, when you wish to use it.

**THE AMERICAN MONORAIL COMPANY**

13123 ATHENS AVENUE CLEVELAND 7, OHIO

For more facts circle 553 on Reply Card



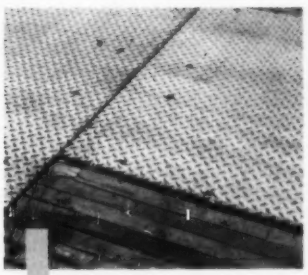
# SAFETY PAYS OFF

- Save Man Hours
- Pay Lower Insurance Rates
- Enjoy Better Fire Protection
- Have Happier Employees

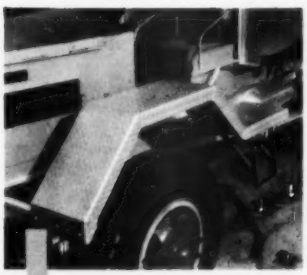
*with Industries' first choice of safety flooring-*

INLAND

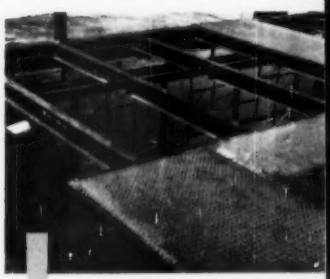
## 4-WAY® safety plate



*for replacement*



*on new equipment*



*in construction*

# 4-WAY® safety plate

## firesafe

4-WAY is popular as a safety flooring in plants and for product use where fire hazards are a problem. Resists intense heat and shock with ease. Eliminates fire risk, reduces insurance costs.

## attractive

Popular demand for 4-WAY also results from its attractive appearance, eye-pleasing design. Pattern is uniform in all directions, pieces are easily matched. Looks good even after years of service.

## economical

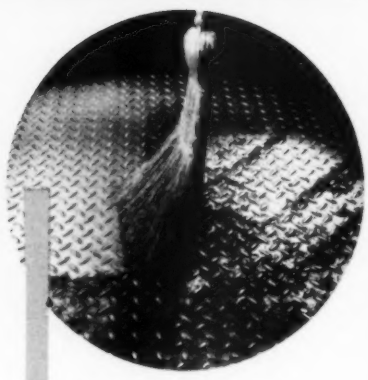
You'll be floored by 4-WAY's low cost! Initial cost is competitive with other flooring materials, installation cost may be less. Repair cost is practically eliminated. Maintenance is trouble-free.

## safe

Specially designed raise-lug pattern provides dependable all-weather traction for men and vehicles. STOPS and starts are made quickly, safely—*before* accidents get a foothold.

## strong

Rough abuse and heavy loads are taken in stride by this tough, tried and proved steel plate. Made of finest rolled open hearth steel. Withstands great stresses.



## cleans easily

Where cleanliness and sanitation are prime factors of importance, 4-WAY provides sanitary flooring with no dirt-catchers. Liquids drain away freely, are not absorbed. (Chemical resistant.) Won't splinter, chip or crack.

## there's a 4®-WAY safety plate size and pattern

**TO FIT YOUR NEEDS**

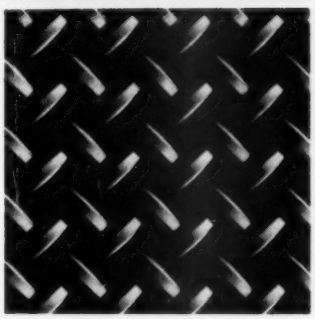
**Can be . . . Flame Cut • Sheared • Sawed • Drilled and Punched • Welded • Formed • Spot Welded**

Goes down fast and flat, fits snug with a minimum of preparation. You have a safe floor surface ready for instant use.

Easy to fabricate and maintain—with the strength found only in steel. These and other advantages make 4-WAY the outstanding choice of industry. See how safety pays off when you use Inland 4-WAY safety plate.

**LARGE PATTERN**
recommended for floors that must withstand tough abuse and heavy loads

**MEDIUM PATTERN**
the most popular and most versatile pattern for use in your plant or on your product



**SMALL PATTERN**
for applications requiring weight reduction or severe forming

(One-half actual size)

### easy to fabricate

4-WAY can be fabricated by any of the conventional processes used on carbon steel plates. On-the-spot cutting, drilling or burning is readily accomplished with standard equipment.

**MAIL** *for more information*

**CLIP THIS COUPON**

**INLAND STEEL COMPANY**
38 South Dearborn Street
Chicago 3, Illinois

Gentlemen:

Please furnish me with the following information on 4-WAY safety plate:

☐ Catalog ☐ Availability and ordering information

Name _____ Title _____

Firm _____

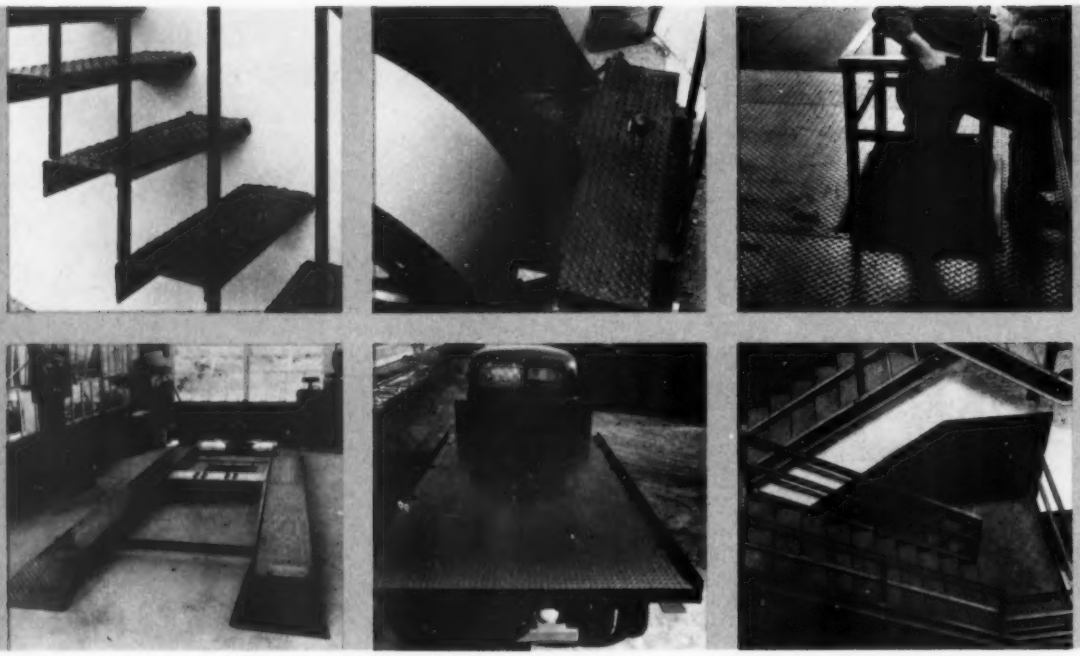
Address _____

City _____ Zone _____ State _____

A B C D E F G H I J K L

# Inland 4-WAY® safety plate

PROVED IN USE



Actual use under the most trying conditions has proved Inland 4-WAY the versatile answer to flooring problems. Rugged, long lasting, it combines safety, strength, fire resistance and ease of maintenance all rolled into one. See for yourself how 4-WAY can safeguard you best and save you more. Send for the catalog that tells the complete 4-WAY story.

***Stocked by leading steel warehouses throughout the U.S.A. and Canada***

INLAND

**INLAND STEEL COMPANY**

**38 South Dearborn Street • Chicago 3, Illinois**

**Sales Offices:** *Chicago, Milwaukee, St. Paul, Davenport, Kansas City, St. Louis, Indianapolis, Detroit, New York*

# PITT CHEM STOPS Moisture and Atmospheric Corrosion on Structural Steel!

You could apply ordinary paints to exposed steel structures like this for the rest of your life without finishing the job. For by the time you've completed one end, moisture and corrosion have started to eat away at the other. It takes tough, durable materials like Pitt Chem Tar Base Coatings to do a lasting job.

Pitt Chem Tar Base Coatings are up to 10 times as thick as ordinary paints. They are economical and easy to apply. What's more, Pitt Chem Coatings are made from coal tar pitch—one of the most impervious materials ever employed to stop corrosion—and produced in a plant designed exclusively for the manufacture of coal tar coatings. If *you* have a corrosion problem involving steel, masonry, brick or stone surfaces, call on Pittsburgh . . . or see our catalog in Sweet's Plant Engineering File.

W&D 4701

PITT CHEM 101—For Severest Conditions
PITT CHEM 102—Maintenance Coating
PITT CHEM 103—General Purpose Coating
PITT CHEM 104—Potable Water Service
PITT CHEM 105 AQUATAR—A Water Dispersion
PITT CHEM 106 TARMASTIC—Sealing Compound
PITT CHEM 107 PACHKOTE—Specialty Coating
PITT CHEM 110—Specialty Coating

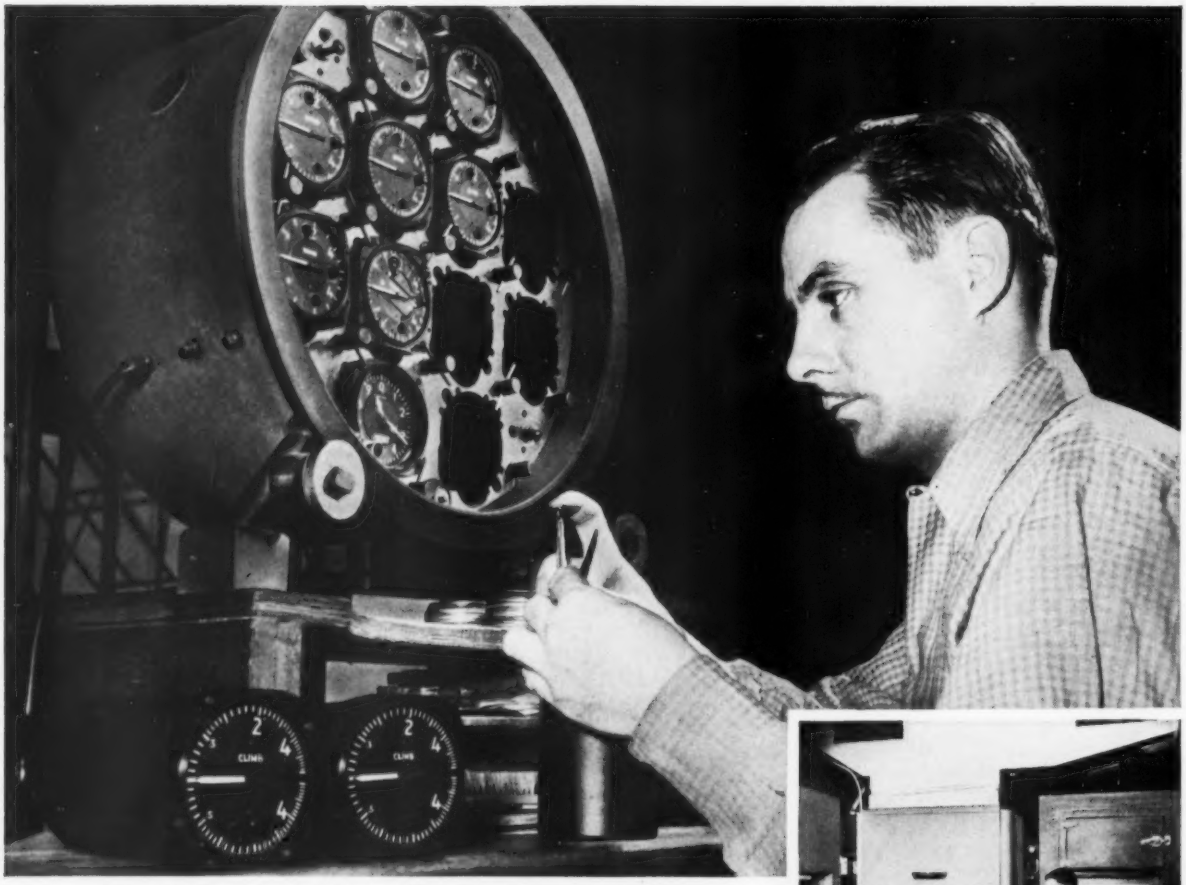
PROTECTIVE COATINGS DIVISION

PITTSBURGH
COKE & CHEMICAL CO.

Grant Building • Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

**For more facts circle 555 on Reply Card**



*Putting Air To Work For Kollsman:* When accuracy measures ± .0002, dirt specks and moisture are poison.

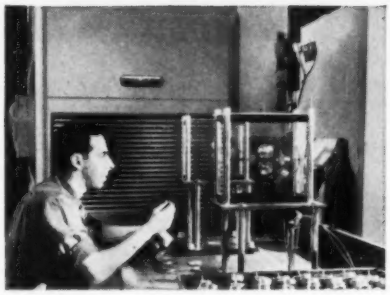
# CONDITIONED AIR

## KEEPS INSTRUMENTS ACCURATE 15 MILES UP

Airborne dirt and moisture are an expensive problem in assembly and testing of delicate aircraft instruments. But Kollsman Instrument Corporation found the economical solution. Fifteen Westinghouse Unitaire® Conditioners now process the air for an entire assembly floor.

By "zoning" this space, each UNITAIRE cools and dehumidifies its assigned area. This gives uniform air conditioning even though heat and moisture-producing operations on the floor vary. And Unitaire Conditioners are easily moved as production layouts change.

You can get the UNITAIRE now from your Westinghouse Air Conditioning Distributor's stock. Call him today. He's listed in the Yellow Pages of your telephone directory. Westinghouse Electric Corporation, Air Conditioning Division, Hyde Park 36, Massachusetts.



Where heat and humidity hamper skilled hands, a UNITAIRE gives constant temperature-humidity control. That's why Quinn Engineering Co., New York, has added ten more units to another Kollsman plant this year. Completely built by Westinghouse with its own proved parts, the UNITAIRE gives trouble-free service and economical operation.

## WESTINGHOUSE AIR CONDITIONING

YOU CAN BE SURE... IF IT'S Westinghouse

J-80310

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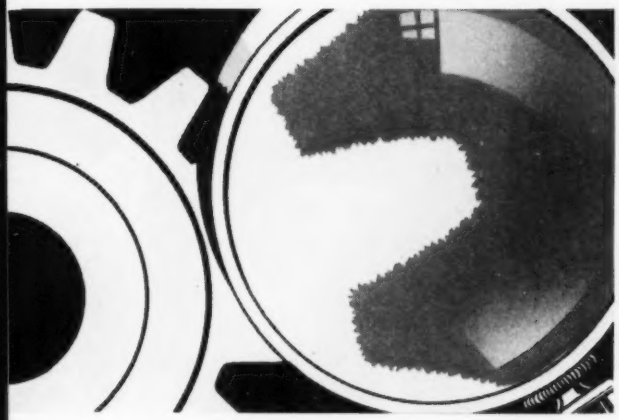
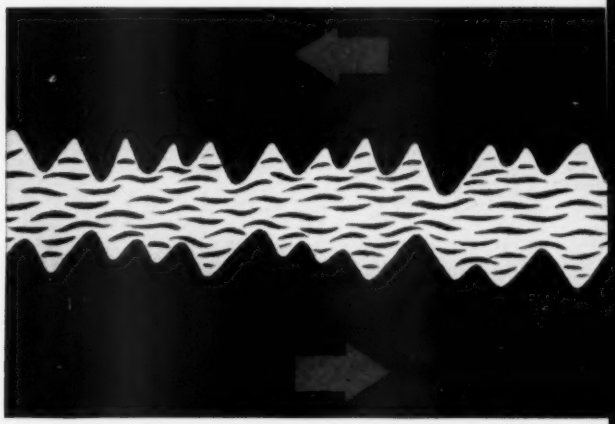
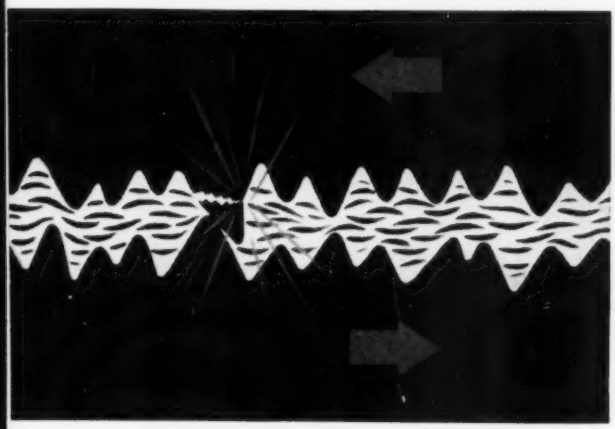
# HOW SUNEP PREVENTS GEAR WEAR



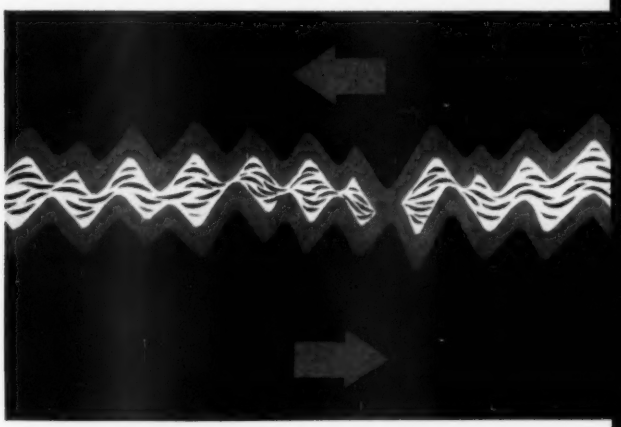
The surface of a gear may seem smooth, but when greatly magnified it looks something like this. The lubricant must keep these jagged edges apart.



With ordinary oil, a thick film is needed to keep these metal surfaces apart. The thickness of the film depends on the viscosity of the oil and other factors.



It is difficult to maintain a thick oil-film in everyday practice. The oil film thins out and semiboundary lubrication results. With ordinary oil, metal to metal contact occurs and gears wear.



Sunep coats the surfaces with a chemically bonded film which is virtually unbreakable. This film, although only about 0.0000001" thick, keeps the surfaces apart, withstands heavy loads and sudden shocks, prevents wear.

Sunep has many advantages. In addition to its outstanding load-carrying ability, it is noncorrosive; it keeps gears and bearings clean; it prevents rusting; it stays put. And its additives do not drop out during use or after prolonged storage. For more information about Sunep and how it protects your equipment, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-6.

**INDUSTRIAL PRODUCTS DEPARTMENT**
**SUN OIL COMPANY**

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# SEE

## HOW YARWAY SEATLESS BLOW-OFF VALVES KEEP BOILER BLOW LINES "DROP TIGHT"

This plastic demonstration model shows better than words how Yarway Seatless Blow-Off Valves operate . . . and why they are used in over 16,000 boiler plants.

The cross-sectioned balanced sliding plunger in the model actually slides, and shows why, in closed position, boiler blow lines are kept "drop tight". Press the plastic tab in and "open the valve" yourself, seeing how it provides free, unobstructed flow in blow-down service.

See also how this valve eliminates one of the commonest sources of blow-down trouble. *There is no seat to score, wear, clog or leak.*

Send the coupon today for your free model.

YARNALL-WARING COMPANY
145 Mermaid Ave., Philadelphia 18, Pa.

**HOW THE YARWAY SEATLESS BLOW-OFF VALVE OPERATES**

When valve is open (plunger raised), blowdown discharges through double ports in lower gland F1 and plunger V. Slotted plunger head S slides on guides in valve yoke, preventing turning of plunger; stop screw A keeps lower gland from turning. Open yoke permits visual indication of position of plunger in valve body.

After valve has closed, shoulder S on plunger V contacts with upper gland F, forcing this gland down into body and compressing fibre packing rings P and P1 above and below port in body. A good hard turn of handwheel at the last gives additional compression of packing around plunger, insuring drop-tight shut-off. Tension springs T under yoke nuts maintain continuous pressure through glands on packing rings, keeping valve tight. Annular groove O connects with alemite fitting on stop screw A for lubrication of plunger and packing. Similar alemite fitting on top of yoke lubricates stem and ball bearings in yoke.

**FREE!**
SEND THIS COUPON

**YARNALL-WARING COMPANY, 145 Mermaid Avenue, Philadelphia 18, Pa.**

Please send me free, a plastic demonstration model showing how the Yarway Seatless Blow-Off Valve operates.

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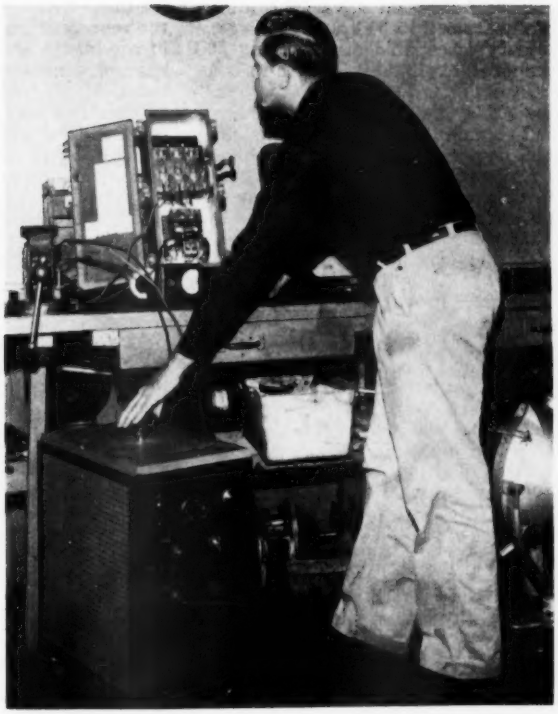
.....

**For more facts circle 558 on Reply Card**

It is important to check and test electrical equipment regularly . . . Planned preventive maintenance is the answer . . . Author cites several trouble spots where possible difficulty may occur

By **CARROLL M. COLE**, Engineer
Dept. of Water and Power, Los Angeles



H. R. Greening checks the major starter overload relays

# Utility Man Looks at Industrial Plant Maintenance

BASICALLY, a utility has fulfilled its service responsibility in providing continuity of service at the customer's meter. However, it is obvious that idle machines use no energy and hence produce no revenue for the utility. Therefore, every utility is interested in helping its customers "shoot trouble" and in recommending and promoting preventive maintenance programs. Several incidents are mentioned which have resulted from failure to check equipment regularly and show what may happen if the company does not have an effective preventive maintenance program.

Practical experience with a number of industrial plant maintenance problems reveals that, in some cases, very little attention is paid to industrial equipment after installation. As an example, let's consider an average industrial plant. Inside the plant there are many three-phase motors, all humming along efficiently. One sub-circuit supplies two motors. One of the fuses in the sub-switch develops a high-resistance contact and begins to heat. Soon it melts out and the conductor ceases to carry current. As a result of this, the current in the two remaining live conductors almost doubles, and the hum of the motors becomes a groan.

Inside the motor starting contactor of one motor, which has recently been installed, there is a click and the overload equipment functions, disconnecting the motor from the line and it slows to a stop.

The other motor, having been installed five or six years previously, soon begins to smoke and eventually burns out. If the fuses ahead of the motor starting contactor blow, no fire results, but frequently the motor burns out before they function. If the fuses do not blow, the motor may break into flame. Overload relays can become immobilized from dirt, dust, and corrosion over the years, and so may be of no protection.

Equipment of this type may not be called upon to function for months or years after it is installed, and it seems rather obvious that it should be checked at rather frequent intervals to make certain that it is capable of opening the circuit when it is called upon to do so. Tests of this sort on equipment that has been installed for some length of time will frequently reveal that it is either entirely inoperative or that the value of the current required to operate it is such as to cause the motor to burn out.

The modern up-to-date plant of Helms Bakeries in Los Angeles has a system of periodical maintenance checks in effect which is a good illustration of planned preventive maintenance. This bakery has approximately 740 motors, varying from fractional horsepower to 50 hp.

The normal maintenance work is done by two men, under the supervision of H. R. Greening, who also has charge of electrical maintenance work in other company buildings in outlying districts. He is a firm believer in preventive maintenance and regular schedules for inspecting the various types of motors that have been set up.

A portable device has been developed to check overload protection on motors every six months to one year. This device loads the motor starters with low voltage current until the overload protection operates. It consists of a variable autotransformer having a fixed winding rated at 115 volts with variable range from 0 to 130 volts. This unit supplies the primary side of a dry-type transformer. The maximum rating of the primary of this transformer is 22.5 amp and the output of

the secondary can be varied continuously from 0 to 300 amp. This secondary is capable of supplying 300 amperes at 10 volts. This is connected to the load side of the overload relay being tested.

The operation of the unit is simple, as proper control is maintained by means of the variable autotransformer and an indicating ammeter installed either permanently in the circuit, or a clamp-on type which, of course, can be used elsewhere as needed. The current is then built up to the proper tripping value as determined from manufacturers' charts and ambient temperature correction.

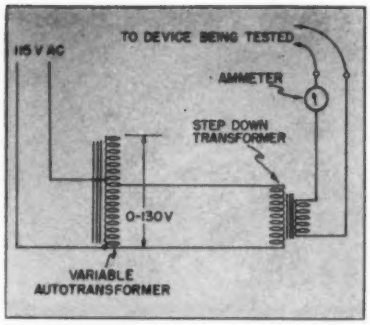
Also, on some types of overload relays, a flashlight with test leads attached can be used to indicate the opening of the overload contacts. All of the parts used in this unit were obtained at Army Surplus Stores at a cost of approximately $75.00. This equipment has saved many times its cost by detecting stuck overload relays before the motors they were supposed to be protecting burned out.

Where complex machines are in use in a plant and trouble is experienced, many times it is due to simple difficulties as, for instance, high resistance contacts in switches and fuse clips. The carrying capacity of a switch is usually limited by the resistance of the contact surfaces of the blades and fuse clips. Of the examples mentioned, failure, in most cases, is the result of improper specification or installation of fuses. It should be realized that the fuse is designed to serve a definite purpose. You are only inviting trouble if the correct fuse is not used or if it is improperly installed.

## Straight Blades?

New fuses do not necessarily insure a flat surface on the blades. A steel straight-edge will usually reveal if the blade is straight or slightly concave or convex. If the blade is not properly draw-filed and made to fit snugly in the fuse clips, it will have three high contact points, which will mean an enormous increase in ampere per square inch current density. As a result, the fuse heats and eventually melts out, rather than blowing.

Another thing to watch is the use of fuses with renewable links. The blades of these fuses are, of course, copper. The bolt which holds the link is usually steel, and the link itself is made of a zinc alloy. Each of these metals has a different coefficient of expansion when heated. As they repeatedly come up to an operating temperature, something begins to give. Usually it is the zinc link which is then no longer bolted tightly to the copper blade. After this happens, a high resistance connection develops and the fuse begins to heat, eventually resulting in a melted out link. Most manufacturers of this type of fuse also make non-renewable types of fuses which are recommended as a possible cure if this incident occurs very often.




**Schematic wiring diagram of portable device which detects any stuck relays**

Fractional horsepower motors, both three-phase and single-phase, are frequently installed with no protection other than ordinary fuses. The ordinary fuse, not being a closely calibrated device, really provides only short circuit protection and is not considered good protection against overload.

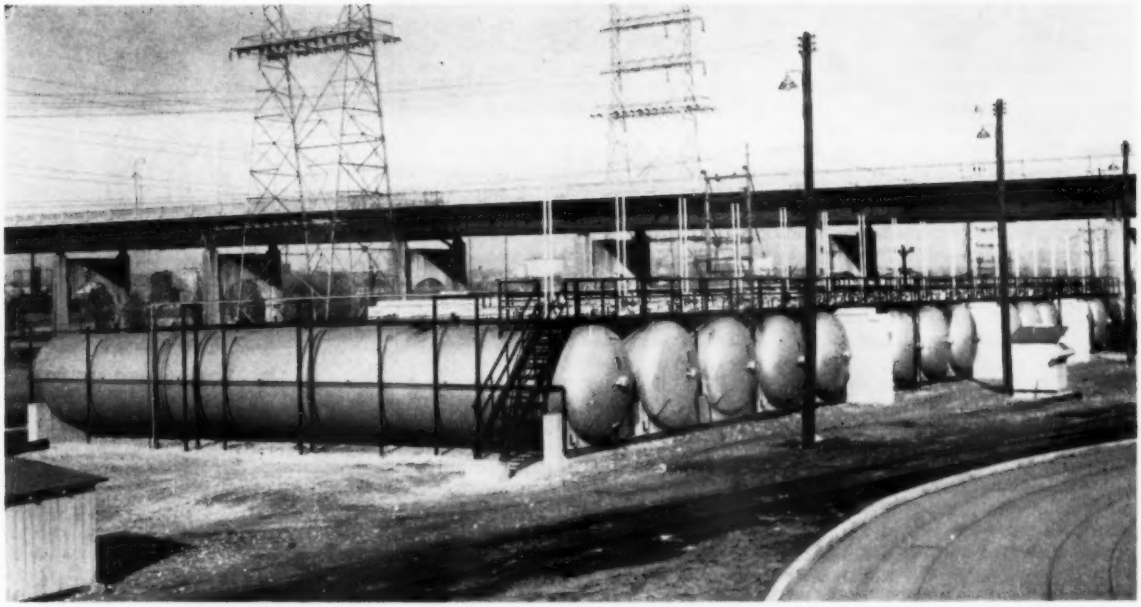
It is, however, possible to obtain fuses which have time delay incorporated as a part of the fuse, thus providing for momentary overloads such as the starting of motors. These fuses are also manufactured in very small increments of capacity so that they may be selected for capacities within a fraction of an ampere of the full load running current of the motor circuit. They may also be obtained in a non-tamperable type of fuse which, of course, insures that only the proper size fuse is replaced in the circuit in the event one is blown.

Most industrial plants expect their maintenance men to furnish their own hand tools. However, if a plant is large enough to have maintenance men, then the plant should provide at least four basic instruments:

1. A good voltmeter with scales covering whatever voltage ranges are likely to be encountered.
2. A hook-on ammeter with which to check circuit loading without the necessity of disconnecting lines.
3. A hook-on wattmeter which will enable motor loads to be measured and power factors to be computed.
4. A meg-ohm meter with which to check insulation qualities.

These instruments will not require a large investment but will return many times their cost by eliminating the guesswork which must necessarily occur without them.

**Overload relays on a traveling oven combustion control panel are also checked**



Each group of tanks is separated by a fire wall. The standby system takes over if regular supply of natural gas is curtailed

# Propane Standby Means No Production Interruption

With an 18-tank propane installation, Caterpillar Tractor Co. does not worry when its regular supply of natural gas is curtailed . . . Continued production is assured by this ready supply of fuel for processes requiring gas

By H. R. McNEELY, Utilities Engineer, Caterpillar Tractor Co., Peoria, Illinois

LIQUEFIED PETROLEUM GAS is proving very valuable as a standby fuel at Caterpillar Tractor Co. to take the place of natural gas. In 1946 the company was faced with a curtailment of natural gas, and to eliminate such an occurrence in the future, they placed a complete liquefied petroleum gas installation in operation.

Between July, 1946 and July, 1947, production consumed a total of 650,000 gal of propane and butane gas. Since that time a curtailment of natural gas has occurred each winter except that of 1951-52. During the five years of operation approximately 2,500,000 gal of gas have been consumed.

The gas is used mainly for two purposes: first, for the core ovens in the gray iron foundry; and second, in heat treatment furnaces throughout the plant. For both of these purposes, both premixing and inspirating type burners are used.

A part of the installation consists of 18 tanks, each with a capacity of 30,000 gal. The plant storage capacity was, at the time of construction, sufficient for 22 days of continuous maximum demand of the plant. Due to the continuous growth of the plants, however, this storage has diminished in terms of supply days, so the company is now considering increasing the storage to something like 20 to 25 days' supply.

Included with the 18 tank installation is a modern piping system and other equipment for vaporizing, blending and delivering the gas to the points of use. The tanks are located in the open. The vaporizing and blending equipment is located close to the tanks and from here to the meter house is a distance of about 500 ft.

Artificial vaporizers are necessary when the propane-air demand of the plant exceeds the capacity of the "natural" vaporizing capacity of the tanks with their respective excess flow values. During very cold weather, when the need of stand-by gas is greatest, this "natural" capacity is at its minimum.

The gas comes to the plant in specially designed high-pressure railroad tank cars of 10,000 gal capacity each. A compressor pumps the vapor out of the storage tank into the tank car to force the liquefied petroleum through a separate line into the storage tank. After all the liquefied petroleum is out of the car, the process is reversed, with liquid shut off, so the vapor is pumped from the car back into the storage tank.

Summer is the best time for stocking of storage tanks, although present trend is toward year-around contracts for delivery of propane. The usual ratio is 1.3 cars maximum in the winter for each car taken in the summer.

A concrete wall is placed between each group of tanks. A railroad side track extends along the yard, with one end of each of the tanks being close to the track.

In addition to the concrete walls between the various groups of tanks, other safety precautions are taken. A sprinkler system extends over the tanks so in case of fire, water can be quickly used to keep the tanks cool and the vapor pressure low. Each tank is equipped with two

4-in. relief valves to prevent tank rupture. A fire house and fire extinguishers are also nearby.

Although the installation did not present many problems, there were several difficulties that had to be corrected. At first butane gas was used. But butane proved to have too high a boiling point to use in the system because most of the pipe lines are outdoors. In winter weather, the low-temperature butane vapor condensed to liquid and formed slugs of liquid in the furnaces—a hazardous condition. Consequently, after this first experience with butane, the company switched to propane.

Then there was trouble with control of the Btu content of propane to convert it on an exchangeable basis with natural gas as far as the burners were concerned. Caterpillar found approximately the right composition of gas through a search of literature and conversation with others who had had a similar problem. It was simply a case of making a little different mixture in respect to the ratio of air to propane vapor. Final adjustment was made by using a correction factor, known as the Knoy C factor, which takes into consideration both Btu value and air-propane gas density to give a constant burner characteristic.

Although there are several formulas which have been developed for determining the proper Btu of the replacement gas, the Knoy formula is the one most widely used. It is based on the relationship between the specific gravity and the Btu of the gas and a theoretical burner head Btu value of all gases after primary air injection. The theory is that the burner head mixture of the gas after primary air injection will be close to 175 Btu per cu ft for all gases.

According to the Knoy formula, satisfactory operation will be maintained with an interchange of any two gases having the same relationship or balance as expressed in factor C. Any two gases having approximately the same C factor will be interchangeable with most equipment made up to and including 100 per cent replacement. The Knoy formula is as follows:

$$\frac{\text{Btu} - 175}{\sqrt{\text{Sp. Gr.}}} = \text{C}$$

Btu = Btu of gas being applied for the C factor

175 = theoretical Btu per cu ft of burner head mixture

Sp. Gr. = specific gravity of gas being applied

C = constant for comparison between gases

The Knoy C factor used in establishing the correct Btu propane-air mixture simplifies the procedure of finding by trial and error what composition mixture can be used to keep burners ignited while switching from 100 per cent natural or artificial gas to any given ratio of propane-natural gas. It is a "burner characteristic" factor, the use of which allows the gas mixtures to be altered without undesirable effect on burners and furnace temperatures. Even though a higher Btu per cubic foot gas results when using propane-air, automatic thermostatic temperature controlling equipment in furnaces throttle the gas supply to give the same equipment temperature.

It was thus that we found a mixture of propane-air at 1340 Btu equivalent in burner characteristics to a natural gas of 1000 Btu. We found this, however, only after a lot of trouble trying to use propane-air mixtures from 1000 to 1250 Btu. The Knoy formula directed us and tests proved it was right.

Additional control equipment will soon be installed to make the Btu adjustments entirely automatic. However, with other operational refinements, we have had much better use of our plant facilities using the gas.

The main disadvantages, we have found, of the use of liquefied petroleum gas are two. The first of these is cost. This ranges from three to four times that of natural gas. A large part of this cost is represented in the value of the equipment necessary to store, vaporize and control the process, and the cost of labor to take care of the various steps in handling the gas, in which trained men duly qualified for this work are required.

In addition to the higher cost, a second disadvantage is the hazardous nature of the gas, which requires periodic checking of equipment, and careful handling. An inspection schedule calling for tanks to be drained, the gas displaced, and an

interior inspection of the tanks is made every five years. Safety relief valves are replaced by either new valves or factory checked recertified valves. To keep up with the most recent changes, some of the approved equipment formerly installed has now been replaced by more recently approved equipment, including such items as relief valves, globe valves, etc. All piping is extra heavy and welded construction is used where possible.

The disadvantages are offset by the dependability of the gas—by having it when we need it. By having the propane gas available when needed means constant operation of the plant, with no shut-downs or curtailment of production due to a shut-down of the processes which require gas. It also means a tremendous lot to the employees, who do not have to lose time due to such curtailment.

The use of liquefied petroleum gas as a standby fuel for production has been of such great value in the Peoria plant that the company has installed a four-tank standby setup at the new Joliet plant and will have a larger unit in the newest plant, now under construction at York, Pa.

**Top view of propane storage tanks shows the sprinkler system arrangement. In case of a fire, the deflectors above the sprinklers spray water over the tanks**

# Controlling Inventories of INDUSTRIAL ELECTRON TUBES

**Here is a requirements analysis program designed to aid users chart long-range needs for electron tubes, key inventory and procurement to usage, and get maximum mileage from both tubes and electronic equipment**

WITH ELECTRONIC devices rapidly becoming standard production tools, industrial users of electron tubes should be interested in a tube requirements analysis service devised by the Tube Department of the RCA Victor Division, Radio Corporation of America, and administered by RCA industrial tube distributors.

The service is designed to help the industrial tube user to simplify his tube procurement and inventory problems and reduce his overhead and operating costs. It seeks to accomplish these objectives by establishing means to:

**1. Indicate proper reserve inventory for key tube types. 2. Expose overstocks of infrequently used types. 3. Systematize placement of renewal tube orders far enough in advance to assure uninterrupted operation of equipment. 4. Obtain more efficient equipment operation.**

The service revolves around a continuous analysis of the customer's long-range tube requirements, according to L. S. Thees, general sales manager of the RCA Tube Department. The analysis is established and maintained by either the distributor or the customer, or both. It serves to chart the user's yearly tube consumption by type, present a continuous picture of his tube needs, and assure the adequacy of his reserve tube inventory, as indicated by the following case history:

In the case of the John Doe Manufacturing Company, the initial survey of Doe's electronic equipment and tube requirements was made by the local RCA distributor. The running analysis is being maintained by Doe engineers on special tube history cards and analysis sheets provided for this purpose by the distributor.

The distributor survey showed that Doe uses 35 different electronic instruments, which require a total of 500 electron tubes representing 60 different types.

Each type has been recorded by Doe engineers on the tube history cards, together with such pertinent data as the date the tube was placed in service, its particular application, and its operating schedule. To this basic data, the keeper of the charts will add such developing information as signs of deterioration, date of such signs, and date tube is retired from service.

After the analysis service has been in operation for a reasonable period, both the Doe Company and the RCA distributor will be able to chart the performance of each tube type per application and draw the necessary conclusions to streamline the user's inventory and reorder system.

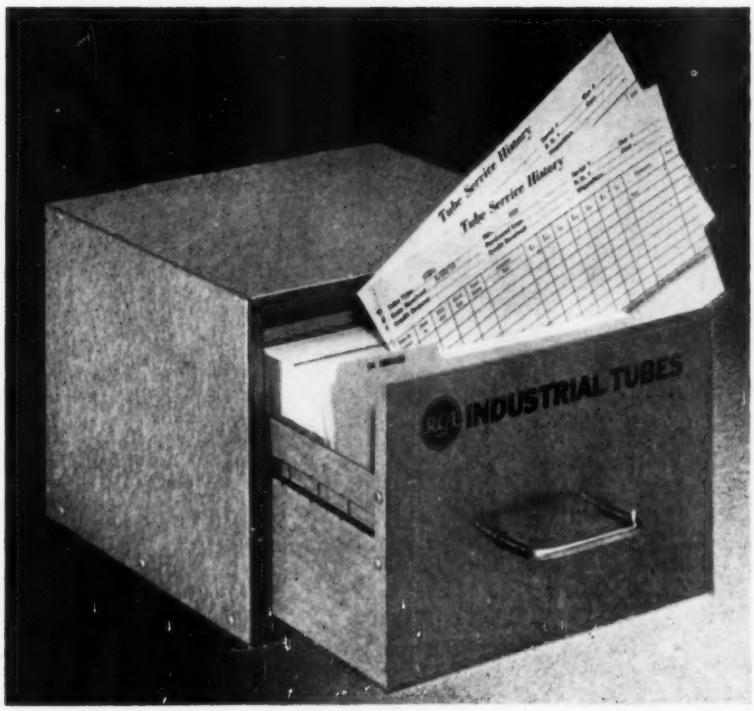
Let's assume that Doe engineers have charted the performance of sufficient quantities of each tube type, operating long enough to provide a comprehensive statistical analysis of tube operation.

The analysis indicates, for example, that type-A tubes, in a particular application, operate with maximum efficiency for an average period of nine months. It also shows that type-B tubes serve efficiently for an average of only three months, because in their particular application, they are operated at full capability on a 24-hour basis.

Armed with this information, the distributor is in a position to recommend what reserve stocks of each tube type the Doe Company should maintain. These cost-saving recommendations will take into account both the hazards of equipment shutdown and the cost of maintaining unreasonably large reserve stocks.

Further, since Doe engineers and the distributor have learned that in their given applications the A and B tubes will require replacement at average intervals of nine months and three months, respectively, it is possible to set up an automatic re-order schedule for replenishing the user's reserve stock.

Based on the findings of the statistical analysis, each of Doe's tube types can be keyed to the same economical inventory and re-order system, according to tube usage. The longer the analysis plan is followed, the more accurate — and the more valuable — the findings will be.




**One of the important elements of RCA Tube Department's current Tube Requirements Analysis Program is the special tube history file index shown here. Other parts of program are tube inventory chart and industrial products brochure**

THE DOCTOR PRESCRIBES FOR HIMSELF

# TOOL CONTROL SYSTEM at IBM's Endicott Plant

This system, which makes it virtually impossible for employees to return tool to wrong location, has achieved: maximum use of existing tools, complete records of location and usage throughout plant, high quality work turned out by each tool; fool-proof tool inspection

AT THE ENDICOTT PLANT of the International Business Machines Corporation, a system of tool control has been instituted which aims at achieving the maximum use of existing tools, providing complete records of location and usage throughout the plant, and maintaining the quality of work turned out by each tool. The system of tool control that has been set up has made it virtually impossible for tool stores personnel to place returned tools in incorrect locations. Since this system's installation losses have been less than one-half of one per cent of approximately 70,000 tools on location in the company's tool stores areas.

**Tool Storage:** A tool is accepted by the Tool Stores Department only after its approval by the Tool Inspection Department. When it is received, Fig. 1, with an "OK" card attached certifying its readiness for use, a permanent tool crib location is set up for it and a record card listing the part number for which the tool is required is then prepared. This card, which shows the part number, the tool number, the tool name and the tool crib location assigned, is then filed by part number in numerical order. The same information is posted to another card which is in turn filed by tool number. Both cards are shown in Fig. 2. This provides, in readily accessible form, the fundamental information of tool location and tool usage which must be the basis of an effective tool control system.

**Tool Use:** Up to this point, the system tells only where the tool is stored. When it is in use, the system provides a means of indicating where the tool is being used and for what purpose. To perform these functions, IBM has devised a requisition in the form of a punched card which is made out in duplicate when a tool is required on the machine floor.

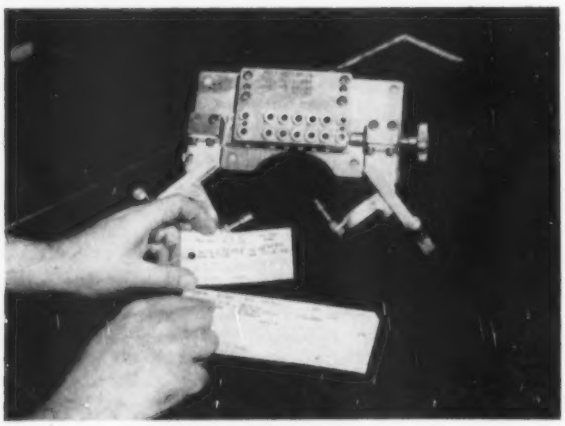


Fig. 1. Drill jig being accepted in tool stores from tool inspection. OK tag and work order are visible. These orders are signed by tool stores man accepting custody of tool

When a requisition, Fig. 3, comes from the production department to the Tool Stores Department, the crib location is easily added to it from the information posted on the tool location card—which has been filed by tool number. Before the tool is released, the tool location card is marked to show the date on which the tool is requisitioned and department to which sent.

One copy of the original requisition is placed in the location from which the tool has been removed, where it remains until the tool is returned. The tool and the second copy of the requisition are then forwarded, Fig. 4, to the department requiring the tool. On receipt of the tool requisitioned the second copy of the requisition serving now as a receipt form, is returned, via vacuum system, Fig. 5, to the Tool Stores Department where it is filed by tool number pending return of tool.

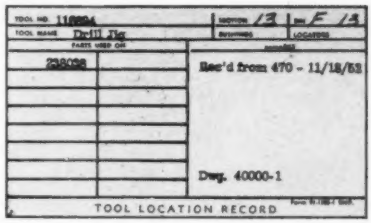
When the tool is returned to the Tool Stores Department, the file card, showing the location in the tool crib, is pulled, Fig. 6, and the tool returned to the tool crib where the original requisition is checked to insure that the proper tool is being returned to the proper location. The date of return is added to the permanent tool location card at this time.

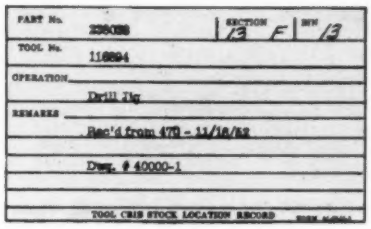
**Tool Efficiency:** To maintain tool efficiency and prevent production delays, the process inspector or the operator on the machine floor has the responsibility of inspecting the last piece produced by the tool. If the part check is satisfactory, the inspector signs and attaches an "OK" tag to the tool. If the piece is unsatisfactory, or if trouble has been experienced in running the order, a tool reject card is prepared and attached to the tool. This card is colored red and is designed to attract attention. It shows full information as to the discrepancies or troubles experienced as well as the status of the parts order and its priority.

**Tool Repair:** When the tool and the tool reject card come into the Tool Stores Department, a card similar to the original requisition is again prepared in duplicate with the information pertaining to the tool rejection filled in. These two cards are then sent to the Tool Inspection Department with the tool and the red reject card. One copy of this duplicate card is returned to Tool Stores where the proper notation is made on the tool location card.

After the Tool Inspection Department checks the tool, Fig. 7, a handwritten order is prepared and sent with the tool to the Tool Room for the necessary repairs. When the tool has been repaired and approved, an "OK" card is attached to it and the tool, with the repair order, is forwarded to the Tool Stores Department. The tool is returned to its crib location, the repair order signed and returned to Tool Inspection.

**Assembly Department Tools:** Since the greater number of assembly tools are used regularly, they remain



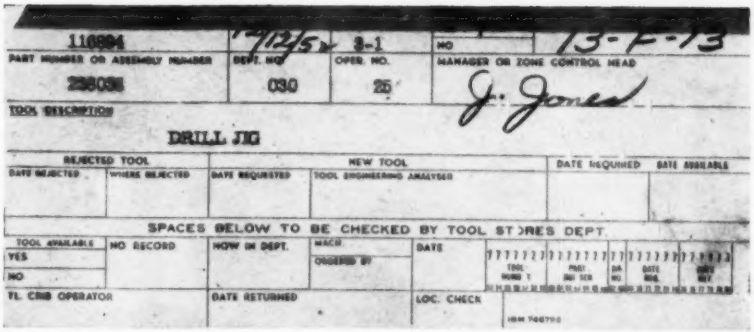




Fig. 2. Left: Tool location cards. These cards are cross-indexed by tool and part number and are made out for all new tools received from tool inspection.

Fig. 3. Above: Tool request card comes in original and duplicate. Original, shown here, remains on location awaiting return of tool. The duplicate accompanies the tool to the department which requested it. It is then returned to tool stores suspense file, via vacuum tube (see Fig. 5) pending return of tool

in the assembly departments, and the Tool Stores Department keeps records only of the department to which the tools are delivered and the date. No crib location is set up in the Tool Stores Department until such time as assembly tools may be returned to them for storage.

IBM cards are prepared in duplicate for all assembly tools, one copy being sent to the department using the tool while the second card is placed in a master file. Lists are prepared annually by both tool and part number from the cards in this master file, showing all assembly tools, part numbers on which they are used, departments using them, operation number, drawing number and other pertinent information. This procedure permits full use of existing tools wherever possible on any new assemblies to be tooled up.

**Tool Obsolescence:** Because of improved manufacturing methods, engineering changes, new and improved materials, better design, etc., tools often become obsolete. Upon notification by the Tool Engineering Department that a tool has become obsolete a special card is prepared and substituted in the tool location file for the original which is then destroyed. The obsolete tool is then removed from its original location and is placed in a special obsolete crib and its new location posted to the special card replacing the original tool crib card.

If an obsolete tool is not used during a one-year period following the date of its storage in the obsolete crib, the tool is scrapped and all records marked accordingly. Should it become necessary to use an obsolete tool, a new one-year period is started beginning with the date of its return from the production line to the obsolete crib.

**Perpetual Inventory:** A perpetual inventory on expendable tools, such as drills, taps, reamers, etc., is required because the fluctuation in the usage of these tools makes it necessary to maintain a minimum inventory of stock on hand to cover a period of three months.

Since expendable tools are purchased as catalog items from vendors and do not carry IBM tool numbers, individual code and location numbers are set up for each item on a separate sheet which is filed in a code number sequence. These sheets are brought up to date semi-weekly, Fig. 8, to show the following information for each code number: quantity withdrawn; quantity received; quantity in stock; quantity on order; immediate requirements; quantity used during last quarter; quantity used to date in present quarter; special indication when additional quantities should be ordered.

The figures for the minimum perpetual inventory are based on the previous quarter's usage. When the supply on hand of any individual item goes below the usage in the previous quarter, the item is automatically flagged when the transaction is transferred to the facsimile stock card. This procedure gives the stock clerks ample time

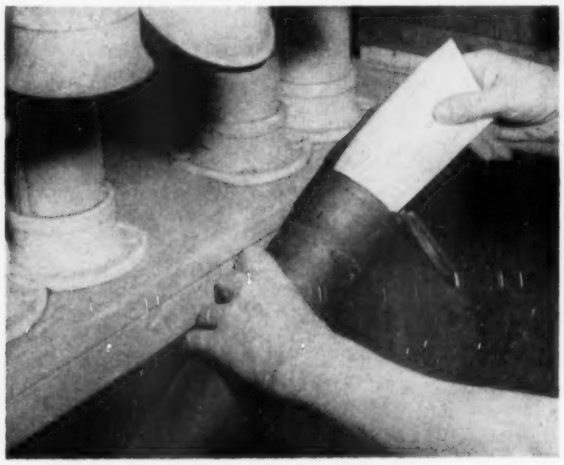


Fig. 4. Left: Tools are sent to departments requesting them by way of a small elevator which connects departmental cribs with tool stores. Fig. 5. Below: Duplicate card which accompanies tool is returned via vacuum system

Fig. 6. Card is pulled from suspense file upon return of tool. This card stays with tool until tool is replaced in location after which original and duplicate are matched to insure tool is being placed in its proper location in tool stores

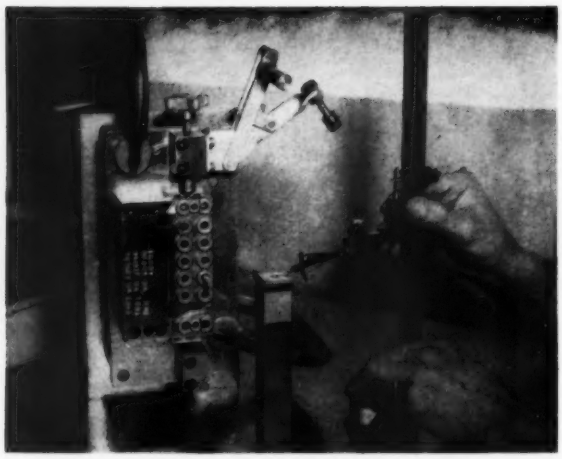


Fig. 7. Drill jig being looked over in tool inspection department. When and if it has been okayed it will be returned to tool stores with an OK tag and work order. Here it is being checked for okay with height gage and Hoke blocks

to place an order for the next quarter's supply and guards against any possibility of running out of stock.

As replacements are required, old tools must be returned to the Tool Stores Department in exchange for new ones. Should any abnormal increase in the use of any particular item be evident, the manager of the department in which the item is used is asked to investigate.

**Inspection Gage and Electrical Test Equipment Control:** In order to maintain complete control of all inspection gages and equipment (both electrical and mechanical), which is essential to efficient quality control, the following procedure is adhered to by all departments, whether manufacturing, assembly, or inspection:

To establish and maintain proper records, and to assure that gages and equipment are assigned to their proper use, all requests for new gages or electrical test equipment as well as requests for change in such existing gage or equipment, are made in writing to the Tool Engineering Department. The purchase of gages classified as standard equipment (such as dial gages, plug gages, thread gages, voltmeters, Ohmeters, Wheatstone bridges, etc.), are made in writing to the gage crib.

All gages and electrical test equipment, regardless of their function, are inspected and approved by the gage crib before being placed on location.

At the initial inspection of a gage the inspector makes out a master card bearing the tool and drawing numbers of the gage, its function, and the part numbers upon which it is to be used. This card presents a life history of the gage by entries for each change or repair made and for each inspection.

The location of all gages is maintained in the gage crib, Fig. 9, on cards which are filed numerically.

Gages are issued on a requisition form filled out in triplicate. One copy is placed in the gage location, one copy goes with the gage, and one copy is placed in the "due date" file. Gages are returned to the gage crib promptly at end of run or order of parts.

Except in cases where special conditions necessitate more frequent inspection, all gages and equipment not in the crib location are checked periodically as follows:

Cylindrical plug, plug thread, ring and ring thread gages are checked at the end of a run of parts or ten days, whichever is the less.

Electrolimit, Sheffield and other comparators are checked once every six months.

Hoke blocks are checked according to their classification: Class 1 (.00000 - .000020 accuracy) once each

(Continued on page 156)

Fig. 8. IBM facsimile posting machine eliminates manual errors in control of stock records on expendable tools. Records show when material was requisitioned, department requisitioning, and similar data of value in tool storage

Fig. 9. Small male thread gage being removed from its location in the gage department to be used on the machine floor. Rejection of gages or request for repairs is made on a special form which, with gage, is submitted to gage crib

# PIPE INSULATION "Snaps" Into Service

A NEW ONE-PIECE molded fine glass fiber pipe insulation, known as G-B Ultrafine Pipe Insulation, offers many advantages for industrial applications.

Among the many different features of this insulation listed by the manufacturer are the following:

1. Exceptional thermal efficiency—K factor is considerably lower than that of any conventional pipe covering.
2. Light weight—The new product is four to 10 times lighter than any other on the market.
3. Flexibility—It can quickly and easily be spread at the seam to snap over pipe.
4. Resilience—It quickly snaps back into its original cylindrical shape when applied over pipe.
5. Non-breakable—Because it is flexible and resilient, the insulation will not break, powder, crumble, bend out of shape, or otherwise deteriorate in transit, in storage, or on the job.
6. Insoluble in water—It does not become soft or muddy in contact with water.
7. Cuts readily—Can be quickly and accurately cut with an ordinary knife. No special tools needed.
8. Clean and pleasant to handle—No irritating dust, no coarse fibers.
9. Can be painted—The new material can be painted for the sake of appearance, left "as is," or finished as desired.
10. One-piece 6-ft lengths—Because its 6-ft length is lighter than conventional 3-ft lengths of other insulations, the new material can be applied much faster and easier.

Standard methods of application are used; such as bands, wires, masking tape, staples and jute twine. Once the insulation has been snapped in place, the workman has both hands free to join the seam quickly and easily.

The insulation, according to the manufacturer, will not rot, mold, decay, or absorb moisture. It resists the attack of most acids and alkalis and is not corrosive to metals.

### For Additional Information

**Readers who want additional information on G-B Ultrafine Pipe Insulation may obtain it by writing to The Editor, Plant Engineering, 110 South Dearborn St., Chicago, Ill. Or they may use the postage-paid cards on pages 35 and 169 in this issue.**

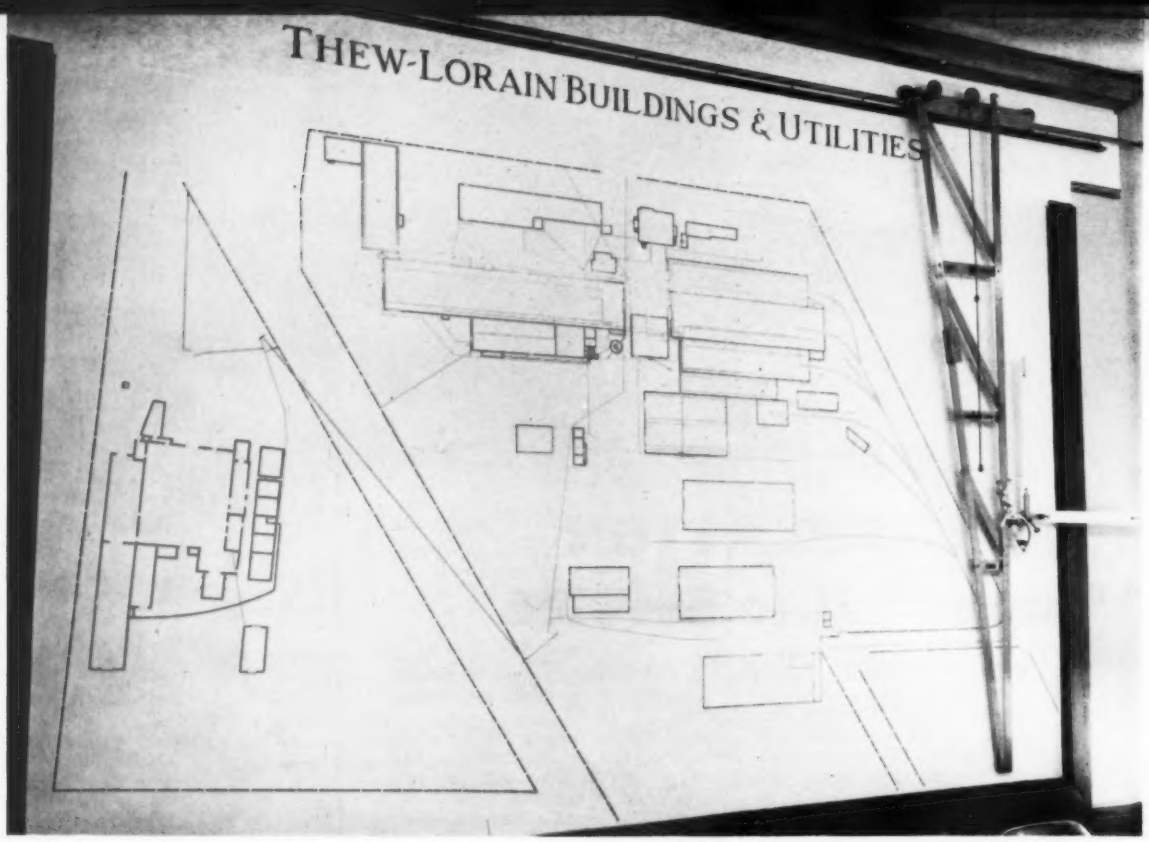



Fig. 1. Working map on 15 to 1 scale, with colored tape outlines. To save space, Plant 4 (lower left) was relocated on map

# PLANT UTILITIES . . . Have You Traced Yours?

## Plant engineer must know "where not to dig" . . . Accurate tracing of utilities results in underground maps . . . History file proves a valuable asset in appraising plant condition

By **WILLIAM C. GARRETT**, Plant Engineer, Thew Shovel Company, Lorain, Ohio

A HIGHLY IMPORTANT and critical phase of the plant engineer's duties has been highlighted by rapid growth in production and industrial facilities. He has of necessity become the historian of industry; he now must know in detail everything about his building and utilities, both above ground and underground, including installation dates, capacities and types.

The last decade has seen the introduction of new and younger managements into many industries. During this period, greater importance has been attached to the plant engineer and his function.

Many engineers entering a growing industry found themselves in the unenviable position of succeeding a man who held the entire layout of a plant locked in his head in typical "bull of the woods" fashion. It appears that few industries ever planned on the phenomenal growth and expansion that many have experienced; thus the need for accurate plant and property maps was not too highly considered as long as the old-timer was on the job. The human memory being a recognized weak point in industrial operations, it was understandable that the size of a sewer or electric cable, as well as its exact location, should be forgotten as time went by.

We must, therefore, sympathize with the plant engineer who finds his plant and production shut down because his digging equipment severed the main current supply while digging a ditch in the plant yard. Many industries are now facing this critical problem and are asking, "What can be done?"

The author does not maintain that a magic formula can be applied to bring the problem to a rapid conclusion. The only solution is the asking of questions and proving every answer.

The basic start must be the available plant drawings. Such drawings must show buildings, utilities and land elevations. Competent civil engineers, preferably those familiar with the site, should be retained to recheck the drawings and prove all dimensions. When the drawings are proven and all corrections entered, efforts must be made to confer with all surveyors and civil engineers who have performed their services on the premises. This move is recommended because most of these men retain numerous notes on work performed for a client. With such known facts as were proven on the print, plus authentic surveyors' notes concerning the premises, a presentable foundation is formed for the plant engineer on which to build his data.

Since many firms do not find it economically advisable to retain a full-time civil engineer, the plant engineer must devise an accurate means of recording current data,

thus precluding all but an occasional use of a civil engineer to add corrected data to bona fide plant maps.

At Thew Shovel, a workable method was developed that has proven both economical and efficient. A master property map based on proven facts, was prepared on a 50 to 1 scale and placed in a glass case on the wall of the plant engineer's office (Fig. 3). On the opposite wall, a means of constructing a much larger working map, on a 15 to 1 scale, was devised (Fig. 1). Construction of the larger working map was initiated by preparing a hard board base and applying several coats of flat finish white paint, thus providing a surface that could easily be kept clean. To lay out the map, a drafting machine was secured to a frame suspended on a track running along the top of the map. This machine was maneuverable to any spot on the layout map, for marking alterations.

To achieve the "working" feature, a means of marking buildings, utilities and boundaries had to be found that would permit ready removal from the map surface without discoloration or marking of the map. Several inquiries made concerning the existence of a cellophane-type tape that would serve this purpose led to the purchase, from Minnesota Mining and Manufacturing Co., of a supply of ⅛ in.-wide tape in various colors. Since the map scale required narrower tape, it was necessary to split the commercial tape into two 1/16 in.-wide strips prior to application on the map.

Referring to the master map, which showed only proven data, a duplication was produced with tape on a 15 to 1 scale. The working map was coded green for water, dark blue for electricity, light blue for drainage, black for buildings and property boundaries. All sewer openings, water valves, shut offs and transformers were accurately located and placed on the working map. As new data was collected, and measurements proven, the working map became well covered. Every 3 months, the data was transferred to the master map. At the time of transfer, civil engineers were called in and instructed to transfer all data from the master map to the regular plant tracings.

The collection of true data was in itself a highly discouraging job. Existing drawings indicated water line and sewer sizes and also showed electrical distribution lines but dates of installation were entirely lacking. In many cases, abandoned utilities were not shown on the drawings. Constant checking with various contractors, who were known to have installed the work many years earlier, proved the age of the majority of the utilities. In this process of proving utilities, numerous abandoned electrical, water and storm sewers were located. All this data was painstakingly applied to the master map and plant tracings.

One major discovery did not help the author's peace of mind; directly beneath his office is the company's only source of water—a 43-year-old main. Needless to say, progress is

Fig. 2. Author Garrett sits over "powder keg"—43-yr-old water supply main that provides company's only water

being made toward the installation of an auxiliary line to feed the plant water system.

When the master map was completed, it showed all utilities, buildings and property boundaries in the correct position. At this point, such data was carefully transferred to plant tracings and the old tracings reproduced for improved future prints. Several prints were then made on canvas, and set up on roll type map cases (Fig. 4). The narrow tape was applied to show the entire electrical system on one map, natural gas on another, and so forth until each individual utility was traced on a separate map. When re-

(Continued on page 154)

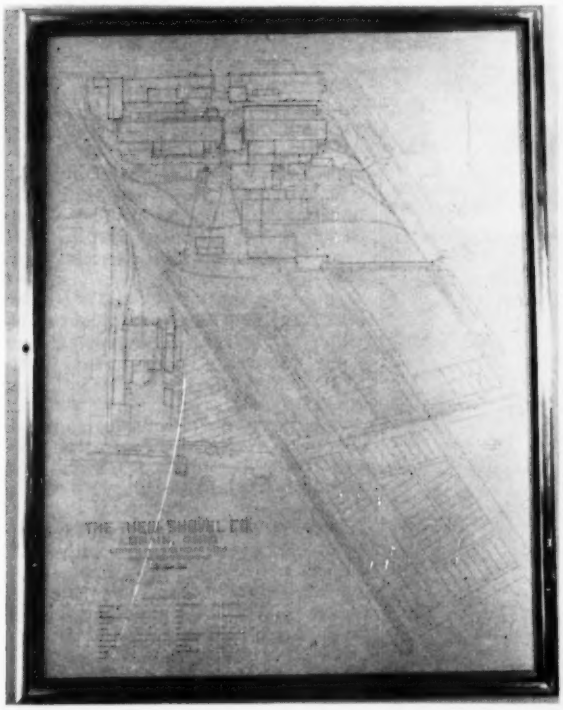


Fig. 3. Framed master map on which proven data is entered

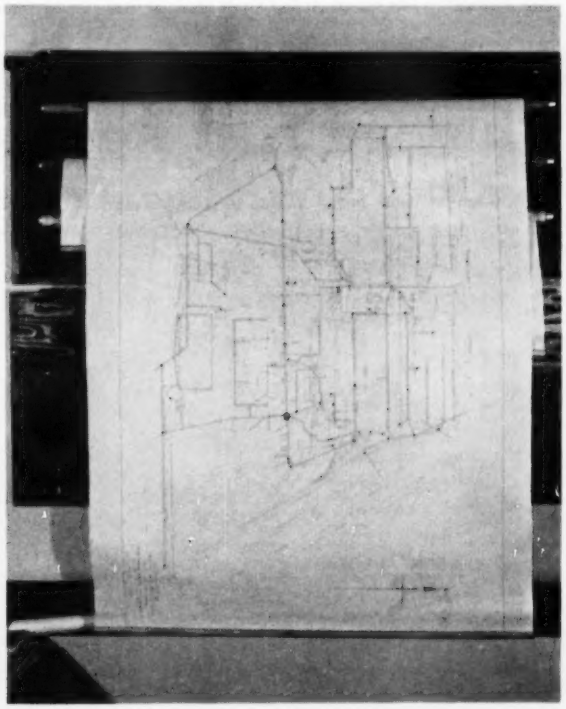
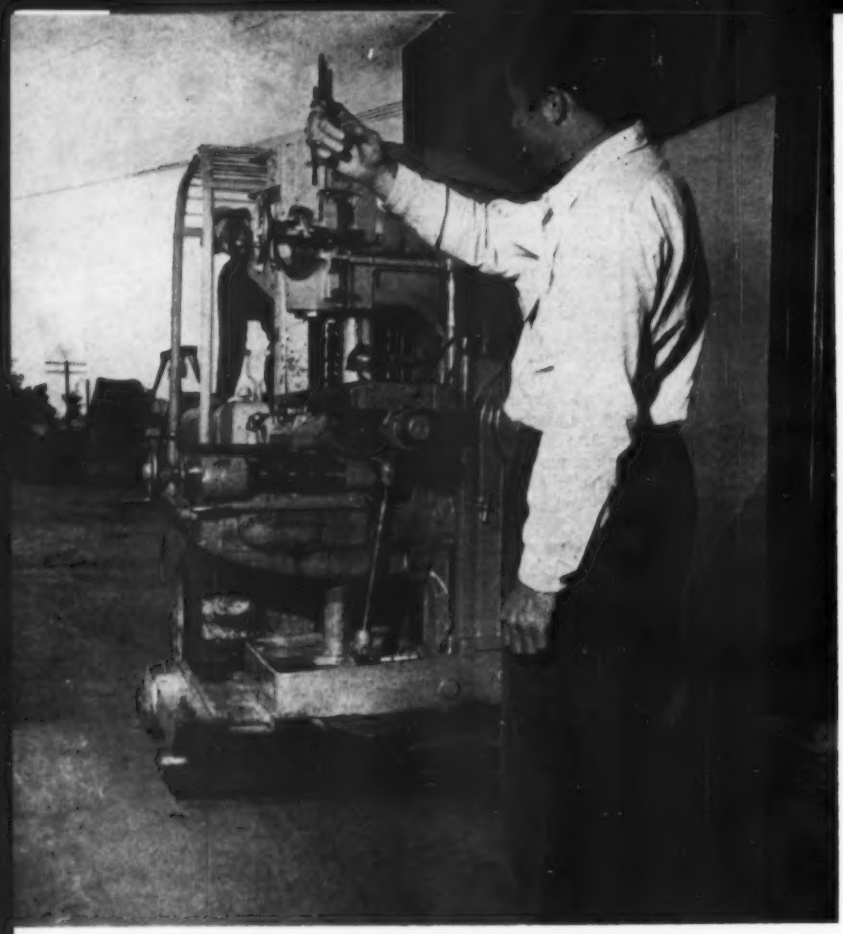


Fig. 4. Utility tracings are mounted on rolls in wall rack



Tired vertical press enters rebuild shops. The old gal will come out better than new

# OLD MACHINE TOOLS NEVER DIE— They're Just Re-Born

Vertical turret lathe being rebuilt in North American's shops as part of program

TO U. S. INDUSTRY everywhere the facts were never clearer: the machine tool shortage is still with us, and probably will be for some years to come. Why? Because 1—Defense production, altho leveling off, still needs machine tools; 2—Last war's tools often aren't good enough, not adaptable to newer methods; 3—Decentralization of industry means more plants; some duplication—more machine tools.

Machine tool shortages have already been tabbed as a prime concern of production planning. And increasingly, the same scarcities are being figured as the jumping-off place for plant engineering.

Take North American Aviation, Inc., for example. Despite a hefty loan of government-issue tools, stockpiled from World War II, it still finds itself short. Has, in fact, been importing some tools from ECA nations.

In 1947, the company's management set up a rebuild plan, began to plan years ahead so that every machine tool on its production floor would get complete overhaul and rebuild. This, thought management, was one way to help alleviate machine tool scarcity.

The Rebuild Plan was turned over to plant engineering.

Altho too early yet for a complete appraisal, the rebuild program has shaped up like this: 1—There's no such thing now as a worn out machine. In some cases, with an expenditure of $3000, plant maintenance shops have put a machine tool which cost $10,000 years ago (and would now cost perhaps $15,000-$20,000) into better shape, with better tolerances than the original, new machine; 2—Every production machine is scheduled for rebuild, complete tear-down and build-up, within the next five years; 3—When old machine tools are rebuilt, generally the latest innovations are incorporated, making them *better* than the originals; 4—It looks now as if most machines can be rebuilt 2-3 times (thus tabbed for use over 15-20 years) before being discarded; 5—Machine tool life has been upped perhaps 10 years, with old age and complete retirement not even in sight for many; 6—Rebuilding can prolong machine tool life in a plant with 20 machines as readily as in one with 4000.

This, says North American's plant engineer, J. P. McNamara, is one way to reduce the machine tool scarcity—both today and for years to come.

The smaller plant can follow North American's lead—with but one change. While North American's own shops do 95 per cent of the rebuilding, smaller plants will likely have to contract out their rebuilding. Still, even North American contracts 5 per cent of its rebuild jobs to subs. As Mr. McNamara says, "We want a half dozen good machine tool rebuilders handy in case

This table shows how scheduling of tool rebuilding has been carefully worked out to give even load on rebuild facilities

DEPT. 41 MACHINERY SCHEDULE — MONTHLY
MAY 1952 THRU APRIL 1954

| | | 1952 | | | | | | | | 1953 | | | | | | | | | | | | 1954 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Machine Type | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | Total |
| 1 | Milling Machines | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 36 |
| 2 | Lathes, Engine | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 72 |
| 3 | Lathes, Turret | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | 22 |
| 4 | Lathes, Automatic | | | 1 | | | 1 | | | 1 | | | 1 | | | | | | | | | | | | | 4 |
| 5 | Grinding Machines | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | 1 | | 1 | 1 | 1 | 40 |
| 6 | Drilling Machines | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 64 |
| | Power Brakes | | 1 | | 1 | 1 | | 1 | 1 | | 1 | | | | | | | | | 1 | 1 | 1 | 1 | | | 11 |
| 16 | Metal Shapers | 1 | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 17 |
| 17 | Router Drills | | | | 1 | | | | | | | | | | | 1 | | | | | 1 | 1 | 1 | 2 | 3 | 10 |
| 18 | Misc. Machine Tools | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 23 |
| | Totals | 17 | 17 | 17 | 18 | 17 | 17 | 17 | 17 | 17 | 18 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 410 |

the job gets too big for us. Giving out 5 per cent of our jobs keeps these smaller rebuilders healthy—and keyed to our machine problems.

Long term or major maintenance is distinctly different from two other types, also the job of plant engineering: routine scheduled maintenance and emergency or breakdown maintenance.

**The Five-Year Plan and How It Works:** Before 1947, the company had no long-term program. When a machine broke down, it usually meant down time, production slowdowns. Worse, with several thousand machine tools under its care, plant engineering did not know, day to day, the exact status of its machines.

Now, two types of categorizing prior to scheduling rebuilding, are used. One treats machines already installed and working. The other concerns new machinery as it arrives at the plant.

**New Machinery:** When a machine is delivered, it arrives at the plant engineer's main inspection and maintenance shops. Here, various teams inspect the machine. Specialized teams include electrical, mechanical and lubrication engineers. The new piece of machinery gets a file card—"Equipment Record"—which lists its vital statistics and specifications (table travel, stroke, speed, bed length, etc.). Wood and sheet metal machinery, which are also entered on the "Equipment Record" card, have a separate specifications section. This same record, which becomes a part of plant engineering's files, tells the make, horsepower and electrical characteristics of its motors, total connected load, etc.

Control for all machines (save for exceptionally large ones) starts in the plant engineering maintenance shop.

Large machines are set up on the production floor and the tests and categorizing done there.

Each inspection team contributes to the "Equipment Record." This is the machine's birth certificate—as fas as North American Aviation is concerned.

Now, the lubrication team takes over. A "Machine Lubrication and Service Record" card is filled out, with lubrication schedules and types of lubrication prescribed for the new machine. No final recommendation as to lubricants is made until a Lubrication Committee sifts the evidence, approves it. Sitting on this committee are a lubrication specialist, a representative from the mechanical section of plant engineering; and a representative from the production development lab (of the quality control section).

Why this committee for each machine tool entering the plant? Well, each contributes a special advisory function. The lubrication specialist is the practical day-to-day guy whose teams will lubricate the machine while on the production floor. The mechanical representative advises about lubrication in relation to the work the machine will do. And lastly, the production development lab man is there to advise about new or unusual lubricants

**Plant Maintenance's stock area where parts are drawn to refit old machine tools**

which might fit the particular machine.

Now, when the proper lubricants have been okayed, a decal coded lubrication instruction is affixed at each lubrication port. These decals are 1½-in. high triangles, with a number in their centers. Each triangle is color-coded. Suppose a yellow triangle with a super-imposed "1" is decaled to a lube port. The lubrication team knows what this means.

Now, the machine is test-run in the maintenance shop while mechanical, electrical and lube engineers stand by. The machine is adjusted to tolerances—and is now ready for delivery to the production floor.

Now comes the rebuild planning. The machine has been tested and appraised. It may be either a new machine, a government leased machine, a foreign-made machine, and occasionally, a (non-government) used piece of equipment.

The plant engineering representative and mechanical foremen estimate its plant use. Will it run one shift or two a day? Will it be engaged in heavy work or light? What is its present condition? And its present life-expectancy? Approximately how many rebuildings will it stand before complete discarding?

The machine is tentatively scheduled at some future date for complete rebuild. While equipment rebuild is roughly scheduled five years ahead, a two-year working period has been found most satisfactory. For example, plant engineering has a monthly breakdown (May 1952 through April 1954) called "Machinery Rebuild Schedule." This shows, as illustration, that a total of 410 machines will be rebuilt in this two-year period. This number is gaged on: 1—Capacity of rebuild shop; 2—The number of machine tools, so that each can come up for rebuild within a five-year period; 3—Age and type of machines in the plant.

Take Jan. 1953, for example. During that month, a total of 17 machines will be rebuilt at North American. This rebuild is complete (may cost up to $3000 per machine) and puts it back into tip-top, "like new" (or better) condition. During January, 2 milling machines will be overhauled; 3 engine lathes; 2 grinding machines; 1 hydraulic press. These figures have been carefully computed according to the number of each type machine at North American.

An incoming machine—a milling machine, for example—may be scheduled for rebuild in 1957. Its rebuild date has been tentatively set for January, 1957. Perhaps it will be a maverick and break down before. This is allowed for, by a flexible program.

**Working Machines**—A year-to-year maintenance record is kept on each machine and occasionally frequent breakdowns send a machine to rebuild sooner. But on the average, every machine tool entering the plant is scheduled for complete overhaul approximately five years hence.

So far, the system is working fine. The shop wants to do more than send the machine back to the production line after rebuild in "as good as new condition." It aims to incorporate any new devices to get a better, closer tolerance job done. Improvements may include: 1—Relocation of control panels; 2—Rewiring; 3—Improved oil seals and bearings; 4—New flame-hardened bearing ways; 5—Increased power.

The rebuild program is quite apart from almost daily, superficial inspections. The annual inspections are part of the program—but are divorced from the Five-Year Plan.

What has been the result to date, with the program only two-three years underway?

First, planned rebuilding has lengthened the life-span of each machine tool, helped beat the machine tool shortage. It has also meant fewer day-to-day maintenance personnel, because rebuilt machines don't break down as often. It has meant big savings in machine tool replacement. For $3000—on the average—a machine tool costing $10,000 five years ago can be reworked into an up-to-date machine, worth perhaps $20,000 on today's market. Machine tools once discarded or sold to industries doing less precise, lower tolerance work, can now be saved, put back on the production line. And, best of all, after a five-year workout, plant maintenance and production men know what modifications are needed to bring the machine to maximum productive capacity under specialized production requirements.

"North American's rebuild program," says Tom Olsson, equipment engineer in the plant engineering department, "means saved dollars, less down time, longer lived tools."

**North American Aviation's rebuild shop, dedicated to beating the machine tool shortage, is operated by plant engineering**

Meeting was attended by the following, seated left to right: Henry O. Loewer, Plant Engineer, Moore Business Forms, Inc., Niagara Falls, N. Y.; Rocky Marinello of Plant Engineering; L. E. Skinner, Plant Engineer, Mathieson Chemical Corp., Niagara Falls, N. Y.; Paul A. Haag, Plant Engineer, Kimberly Clark Corp., Niagara Falls, N. Y. Standing, left to right: G. J. Laehy, Plant Engineer, American Car and Foundry Co., Buffalo; Owen C. Kells, Plant Engineer, Canadian Cellucotton Products Co., Inc., Niagara Falls, Ontario, Canada; and Scoop Skubik of Plant Engineering

# Niagara Frontier Plant Engineers' Society Formed

## Meeting marks beginning of plant engineering society in Buffalo-Niagara industrial area . . . Plant engineers exchange ideas on organization . . . September to open new year for the society . . . Interesting program expected

PLANT ENGINEERS from leading industrial plants in the Niagara Frontier area attended an informal dinner meeting to discuss the formation of a local plant engineers' society. Arrangements were made to have the plant engineers convene at the Park Manor Restaurant in N. Tonawanda, N. Y. This location was selected on the basis that it would be convenient to plant engineers from the Buffalo as well as the Niagara Falls areas.

Those attending this meeting constituted a portion of a group that indicated a willingness to take part in the organizational steps of this society. Other plant engineers in the area will be contacted later and invited to join this organization. The following plant engineers were present at the first meeting: Owen C. Kells, Canadian Cellucotton Products Co., Inc., Niagara Falls, Ontario, Canada; G. J. Laehy, American Car and Foundry Co., Buffalo; Henry O. Loewer, Moore Business Forms, Inc., Niagara Falls, N. Y.; L. E. Skinner, Mathieson Chemical Corp., Niagara Falls, N. Y.; P. A. Haag, Kimberly Clark Corp., Niagara Falls, N. Y.

A round table discussion took place after dinner. It touched upon program planning, meeting places, membership and the society constitution. G. J. Laehy of American Car and Foundry Co. was appointed temporary chairman to coordinate the activities of the group until the time when elected officers are installed. A committee was designated to pool individual thinking and decide what should be part of the constitution.

Plans made at the first meeting called for a presentation of the constitution at the next meeting which was scheduled for Niagara Falls, N. Y., on May 20.

Each plant engineer present at the organizational meeting agreed to invite at least one plant engineer to the second meeting.

During the first meeting, it was suggested that the groundwork for the society be completed before the summer months arrived. Since it is customary for a number of organizations to dispense with activities during this period, this time would be used advantageously in the planning of a good, solid program to open with the first fall meeting.

Through large plant doors such as this can pass some of the coldest air in the country. If you can't keep it out—and you can't, economically—then heat it before it cools the whole building, cools the employees and cuts their efficiency

# HEAT CURTAINS FOR DOORS
# If You Can't Keep Air Out — Heat It!

**This is the time of the year to plan changes and additions to your plant's heating systems, ductwork and other appurtenances . . . Air entering through large plant doors can make employees uncomfortable and cut down efficiency . . . Methods of heating entering air economically**

By **P. D. BOWMAN** and **R. H. EVANS**
**Headquarters Works Engineering Dept., Westinghouse Elec. Corp.**

WITH WINTER gone, the plant engineer should start planning how to cope with next winter's problem of keeping areas around large doors warm while the door is in operation. An unbalanced pressure condition and/or an exceptionally high wind velocity can cause these chilling blasts. In practically every case they can be tempered.

The obvious solution would seem to be a vestibule or "air lock" where one door can be closed before the other is opened. Experience has shown, however, that in new plants, as well as in existing ones, space limitations and material flow make vestibules impractical.

Another method of eliminating drafts which has often met with resounding success is the so-called "heat curtain" or "heat screen." It consists of a blast of warm air spilled past an opening to temper or prevent the passage of cold air into the heated area. To be successful, the blast of air must have sufficient velocity to provide a blanket of warm air over the entire opening.

Obviously, there is a limit to the conditions which can be economically accommodated by this method. In an extreme case, air may pass through a door at a velocity of 1000 fpm. The amount of heat required in such a case would be astronomical and the cost of the equipment in direct proportion. It is up to the engineer to find the medium between design requirements and operational economy.

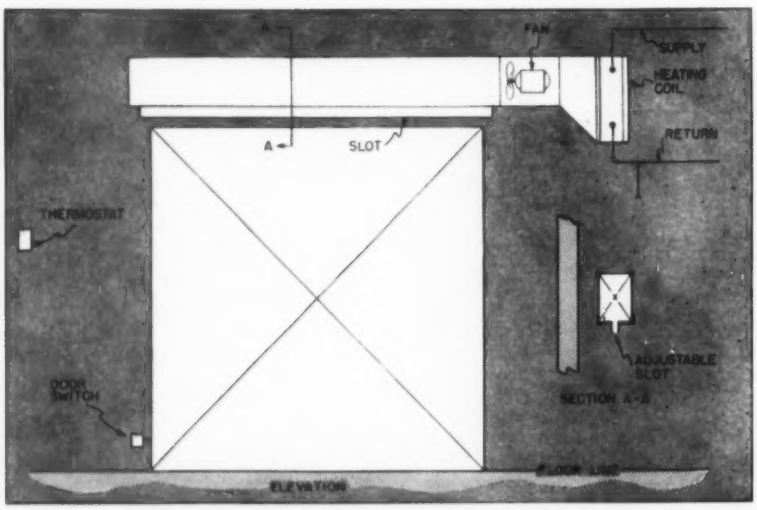



Fig. 1. Arrangement such as this is a top-approach heat curtain for small doors

The factors which affect the design of heat screens are so variable that at best we can only make an educated guess as to what the capacity of the screen should be, or how it should be built. Heat curtains of various designs have been proposed and tried; the ones illustrated have proven by experience to be the most successful.

The size of the heater depends on the amount and temperature of the air coming through the opening and, of course, this is determined by the difference in pressure between the interior and exterior of the building. In existing buildings, the problem is simpler since the velocities of air through the doors (door velocities) can be measured and the amount of air entering the building determined. In the case of new construction, it is necessary to estimate door velocities if the curtains are to be installed at the time the building is erected. Of course, in new construction it is practically impossible to determine precisely the pressure within the plant before it is put in operation.

For these reasons, curtain installation is most often best left until after the building is in full operation.

Complaints usually arise when door velocities reach 100 to 200 fpm. In a few instances, they have been found to be 1000 fpm or more. Normally the interior pressure is higher than the exterior pressure, tending to limit this condition. Since

a small pressure difference between the inside and outside of the building can have a large effect on door velocities, it is desirable to have interior pressures as high as comfort, operation, and economy will allow, thus keeping heat curtain size at a minimum.

When the pressure inside the building has become lower than the pressure outside, the plant engineer should first survey the plant to determine the amount of air being exhausted from the plant by the various systems and attempt to remedy the trouble by the installation of an air make-up system.

This may be accomplished by recirculating a portion of the air previously exhausted, by actually increasing the air intake, by sealing off unnecessary air escapes, or by other methods peculiar to the particular building. This is essentially an air-conditioning problem, of course, and can be best solved by air-handling specialists.

Here are three types of installation which have proven successful:

**For Small Doors (Up to 8 ft high by 8 ft wide)**

Commercial heating coils and duct type fan connected to a plenum duct. The duct is installed horizontally over the door and is provided with an adjustable slot which can be varied as required by the installation. See Fig. 1.

**For Large Doors (Over 8 ft high by 8 ft wide)**

Two sets of commercial heating coils and duct type fans connected to plenum ducts. The ducts are installed vertically along the side of the door, each with an adjustable slot which can be varied as required by the installation. See Fig. 3.

**General Purpose (Up to 10 ft high)**

The third type of heat curtain consists of downblast unit heaters installed above the doors. For doors greater than 8 ft, two or more units are installed. See Fig. 3.

All the units are controlled in the same manner. Figure 4 shows the schematic wiring. The heater fan is started or stopped by a door switch when the door is opened and closed, and by a thermostat located near the door and connected in parallel with the door switch. The purpose of the thermostat is to keep the heater fan running after the door is closed to bring the temperatures of the surrounding area back to normal. By this arrangement, the thermostat also acts to utilize the air curtain heater to augment the heating facilities in the section where the heat curtain is located.

Heat screens are not to be considered a "cure-all" but when used properly they will always reduce complaints encountered where protected entrances or vestibules cannot be installed because of space or other limitations.

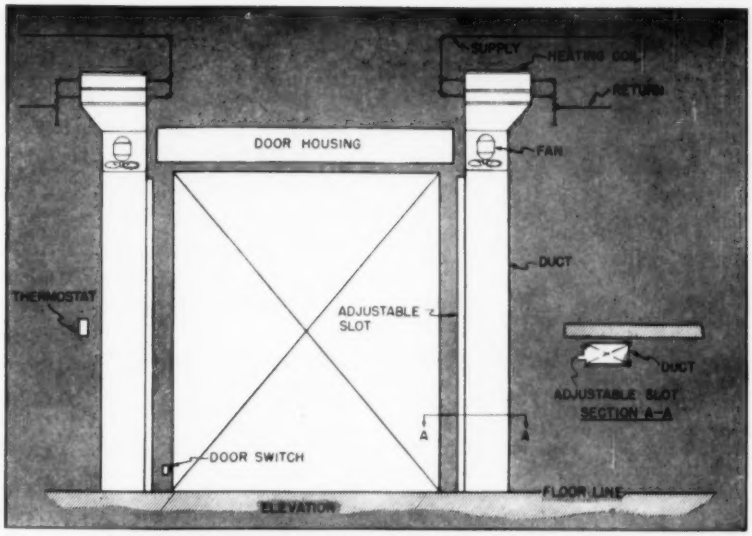



Fig. 2. A side approach heat curtain is usually recommended for wide or high doors

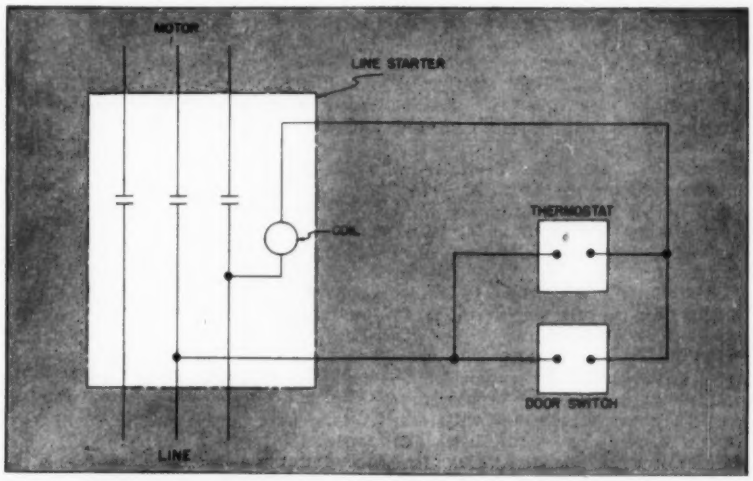



Fig. 3. Here is a general purpose heat curtain using downblast unit heaters

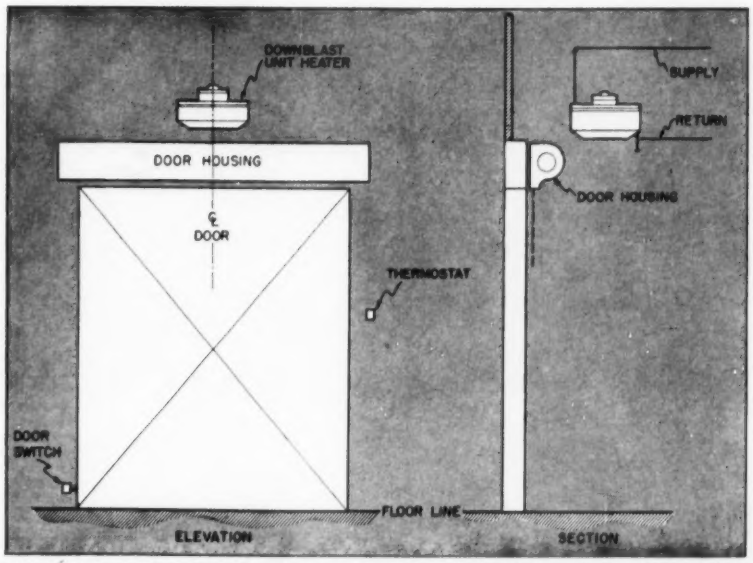



Fig. 4. Fan motor is controlled by both the thermostat and the door switch

# Conveyor Gapping Devices Change the "Time of Arrival"

It is frequently necessary to increase or decrease the space between items on a conveyor line for purpose of labeling, packaging or diverting the item to another line . . . Some of the devices that vary the gap are discussed

By SIDNEY V. WORTH, Mechanical Engineer

IN THE HANDLING and conveying of packages, cartons, bottles, bottle caps and the like, it is frequently found necessary to space these items properly in order to perform another operation on them. For example, cans can be separated and spaced on exactly equal centers in order to label or mark them; at a discharge point, it may be desirable to convey items close together so that several will always be within easy reach of a man packing them; or a good separation may be required so that a diverter will have room and time to divert items to branches, as desired. In addition, proper gapping is often necessary for such operations as inspection, reorientation of the material being conveyed, weighing, counting and discharging.

The gapping solutions described in this article can be adapted to handle most of the items being conveyed today. In almost all cases they can be made in a small maintenance shop ordinarily found in a plant. Furthermore, not only can they be used on new equipment, but generally they can be "cut into" existing equipment.

The simplest, and frequently very useful, gapping device, consists of a plate hooked into place over rollers or skate wheels of a conveyor. Packages traveling over it are immediately slowed down thereby reducing the gap between them. This action is quite smooth so that the device can generally be used for delicate items in addition to run-of-the-mill packages, see Fig. 1.

Of course a gapping plate can readily be applied to a belt conveyor also. It is placed close to the belt with its upstream side beveled to allow packages to slide onto it—and bolted to each side of the conveyor frame.

A belt conveyor can have a short conveyor "cut into" it to either speed up or slow down packages. It may be chain-driven from one of the pulleys adjacent to this section or separately motor-driven. In either case, by changing sprocket diameters, the "short conveyor" speed can be changed quite easily, see Fig. 2.

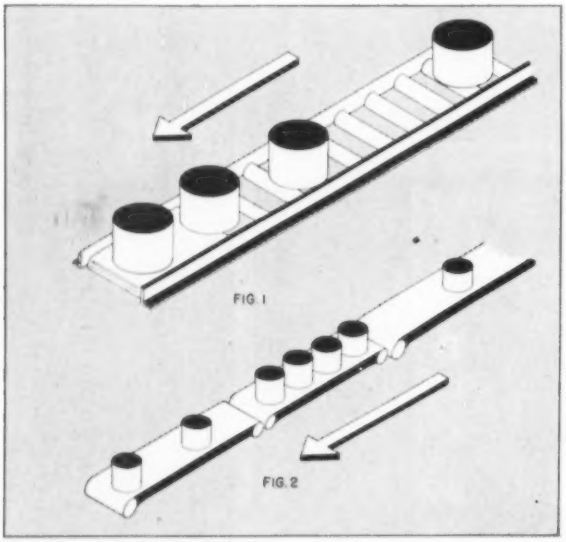
The new belt section can be of a special type to fit a particular job. For example, it can be very rough to grip packages so that they can be stamped accurately without moving, or it can be very smooth so the packages can be reorientated easily.

Small packages of almost any shape, such as cans and bottles, can be handled by a motor-operated star wheel. The package gradually enters one of the pockets and is swept around and discharged at the desired point. It is possible to have 2, 4, 6, 8 or more pockets cut into the wheel. The pockets can be blanked off as desired to vary the speed of handling or the gap between items.

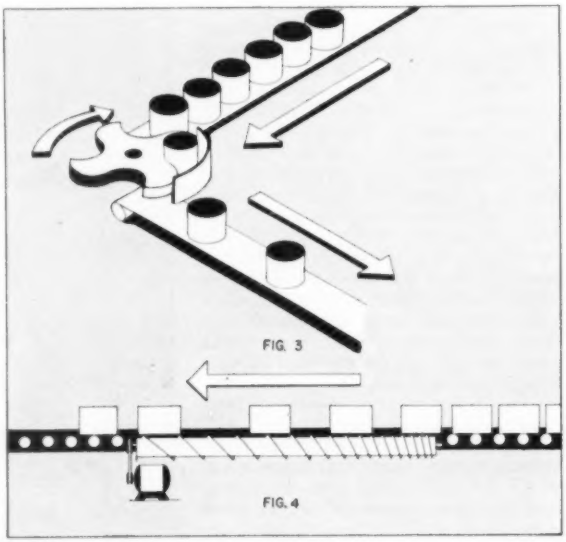
The beauty of this gapper is that not only can it handle its items at different speeds but it gaps them on exactly equal centers as required, see Fig. 3.

A "screw section" with a gradually increasing thread pitch makes an excellent gapper. Either the thread can be cut into a shaft to make the screw, or a wire can be wound around the shaft and welded to it to simulate the thread.

This gapper has the advantage of acting gradually upon the items it is handling—gradually increasing or decreasing their speed. In addition, its rotating speed can be changed




Special plate over rollers, Fig. 1, slows down packages. Short conveyors, Fig. 2, can be "cut into" regular line




The star wheel, Fig. 3, is useful for small packages. The screw section gapper, Fig. 4, acts gently on item handled

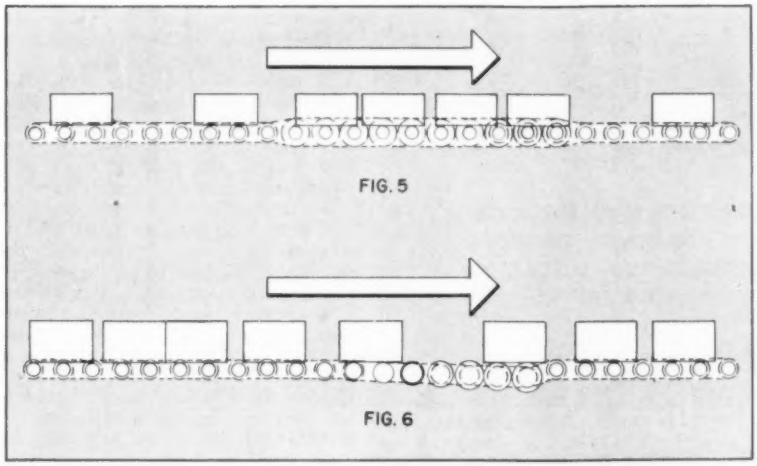


FIG. 5

FIG. 6

**Larger or smaller sprockets, Fig. 5, slow down or speed up package movement. With arrangement in Fig. 6, there is an increase in speed of packages conveyed**

without much difficulty by changing the size of either sprocket, see Fig. 4.

Chain-driven roller conveyors may have gapping devices set into them very easily. The rollers in the gapping section need only have larger sprockets to slow them down —slowing down the packages and decreasing the gap between them— or smaller sprockets to speed them up, see Fig. 5.

Of course there are mechanical limits to the new size of sprockets desired; nevertheless, the range is often large enough to permit the use of this particular type of gapper.

If the gapping section of a roller conveyor is fitted with rollers which increase linearly in diameter and the rollers are kept on equal centers, a gradually increasing speed is given to the packages being conveyed. The gapping rollers must travel at equal angular speed so the driving sprockets attached to them must all be of the same size.

If it is desired, the rollers can be made to increase in size and decrease gradually so that the items being handled will receive a minimum amount of jarring, see Fig. 6.

An air or hydraulic actuating cylinder can be adapted for use as a gapper. In operation, the package strikes the electric switch A which causes the piston rod to extend and then retract. As another package strikes the switch, the operation is repeated. The electric switch can be of the "timer type" so that a desired pause (and therefore gap between packages) can be obtained prior to the retraction of the piston rod. Instead of a timer switch however, switch B can be used along with switch A. When the package contacts switch B, the piston rod will retract, see Fig. 7.

A pivoting section in a roller conveyor can be used for a gapper device. As a package strikes the switch, the solenoid pulls the pivot section down, locking the flow of packages. When the switch is cleared, the flow resumes as the pivot section automatically falls back in line, see Fig. 8.

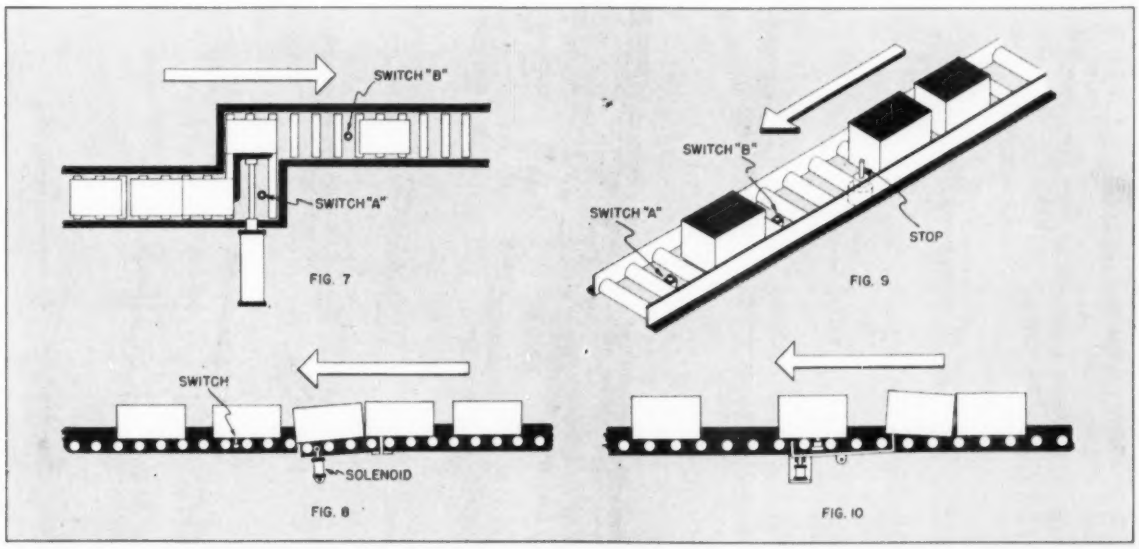
This is a positive and practically trouble-free mechanism. It can be used for almost any item being conveyed and it will act as an exact gapper for the item.

A fairly simple gapper can be made using a solenoid and two electric switches. In operation, a package striking electric switch B, causes the solenoid to push a stop up, preventing any further flow of packages. As the first package rolls along and strikes the switch A, the solenoid pulls the stop back down again, and the operation is repeated, see Fig. 9.

By placing the stop and switches above the conveyor bed, this gapper can be adapted to belt conveyors also. Furthermore, by simply relocating the position of the switches, the gap distance can be varied.

Using a U-shaped, pivoting plate actuated by a solenoid, a gapper device can be made for a roller conveyor or skate wheel conveyor only. It has another limitation in that it can be used on packages of limited size only and those of rectangular shape only. Nevertheless, it is a handy, simple and positive acting device.

Normally the solenoid is extended so that a package can pass over the right leg of the U-plate. When the package strikes the switch, the U is pivoted by the action of the solenoid, preventing further flow of packages. As soon as the first package passes the switch, the U rocks the other way to allow another package to pass, see Fig. 10.




**Various gapping arrangements are possible with switches. Fig. 7 shows an air actuating cylinder; Fig. 8 employs a pivoting section; Fig. 9 uses a solenoid with two switches; and Fig. 10 shows a U-shaped pivoting plate, actuated by a solenoid**

# Selection, Use And Care of Tools

Tubing Tools—The special tools needed for making tubing connections—cutters, reamers, benders, flaring, swaging and refacing tools—are discussed to help you to select the correct tool for the job

By **THOMAS TRAIL**, Maintenance Engineer

SINCE TUBING is not usually threaded like pipe, special tools must be used to prepare the tubing for connections. Some of the special tools and their applications are discussed.

Several types of cutters are available for tubing. The one shown in Fig. 1 is very compact, and is fitted with grooved rollers to permit close cut-offs of cracked flares. A retractable locking reamer is also provided on this tool. A similar tool substitutes a V rest for the rollers, and is claimed to strengthen the tube end for flaring by turning down a certain amount of metal due to the action of the cutter wheel.

Another type of cutter substitutes wing nut for the usual pressure hand wheel. Still another type is arranged for self-feeding of the cutter wheel. This is accomplished by compressing the bent spring metal frame of the tool by turning a wing nut. An integral reamer is provided.

A handy reamer for use in removing burrs from both the inside and outside of tubing is shown in Fig. 2. It cuts in either direction and is self-centering.

Flaring tools, for use in flaring tubing ends for flare connections, are available in several types. The type shown in Fig. 3 is widely used. It consists of two bars, containing a set of holes to fit different diameters of tubing. Clamping these bars together by means of wing nuts grips the tubing. A yoke is then placed over the bars and tightened, thus forcing a beveled plug into the end of the tubing and flaring it.

A self-clamping flaring tool can be obtained having no clamps on the forming bars. Clamping action is obtained by beveling the outside edges of the two bars and the inside edges of the yoke.

Another type of flaring tool utilizes a group of split tubing clamping dies, held in a metal frame with a thumb screw at one end.

An improved type of flaring tool is now being marketed that does not form the flare against a beveled die. Instead, the end of the tubing is permitted to project above the surface of the die and the flare is rolled "in the air." After flaring, the special yoke plug is employed to burnish the flare. It is claimed that the tubing is less likely to crack when being flared with this tool.

Another flaring tool available makes single or double flares on tubing. Double flares are made with the aid of an adapter that bells the end of the tubing before the regular beveled plug folds down the metal into a double-walled flare.

Where tubing is joined together without fittings, a swaging tool is used. The die bar of this tool is similar to that of a flaring tool, but instead of employing a yoke, a set of swaging tools is provided. These are inserted in the tubing ends, clamped in the die bar and struck on the end with a hammer. This enlarges the tubing end so that the end of the other tube can be inserted and the connection soldered. A combination flaring and swaging tool is also available.

A wide-range flaring tool can be obtained to handle nine sizes of tubing, from ⅛ in. to ¾ in. One yoke is employed and two pairs of die bars, one with six tubing openings and the other with three.

A special flaring tool for block tin tubing is also available. It makes 90 deg flares without cracking or splitting the tubing metal.

A pinch-off tool, Fig. 4, is used to temporarily close tubing while making repairs. A set of re-rounding holes is also included to open and round the tubing back into shape after repairs are completed.

Figure 5 shows two types of spring benders. The outside type (A) is slipped over the outside of the tubing, while (B) is an inside type which is slipped inside the tubing.

Lever type benders are also available, see Fig. 6. However, these benders handle only a single size of tubing. Another type of lever bender handles four sizes of tubing, the correct size mandrel being selected and the block adjusted for each size.

A refacing tool, consisting of a reamer and five adapters, is obtainable for refacing the seats in flare connections when defective.

In using cutters, do not force the cutter wheel as this may damage the tubing. Ream the inside afterward to remove the burr and restore full area.

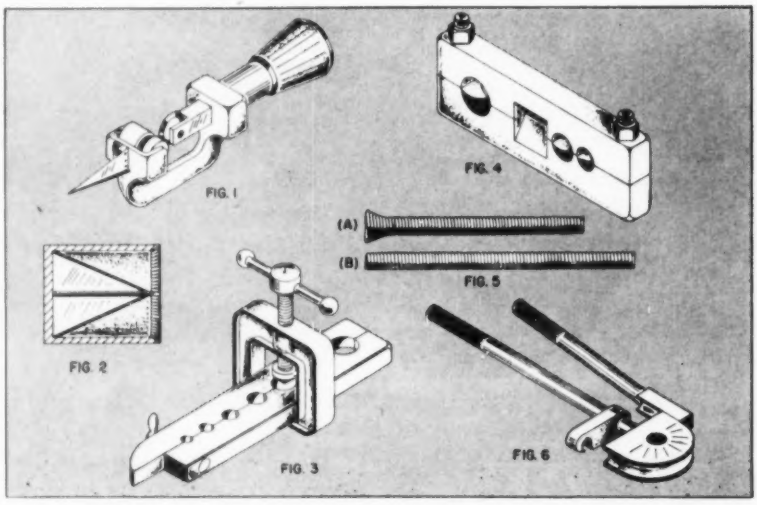
In reaming, apply only moderate pressure, to avoid thinning the end of the tubing excessively.

When making flared ends on tubing, see that just the correct amount of metal projects above the dies. Apply pressure carefully so as to spread the tubing without splitting it. The same precautions apply when swaging.

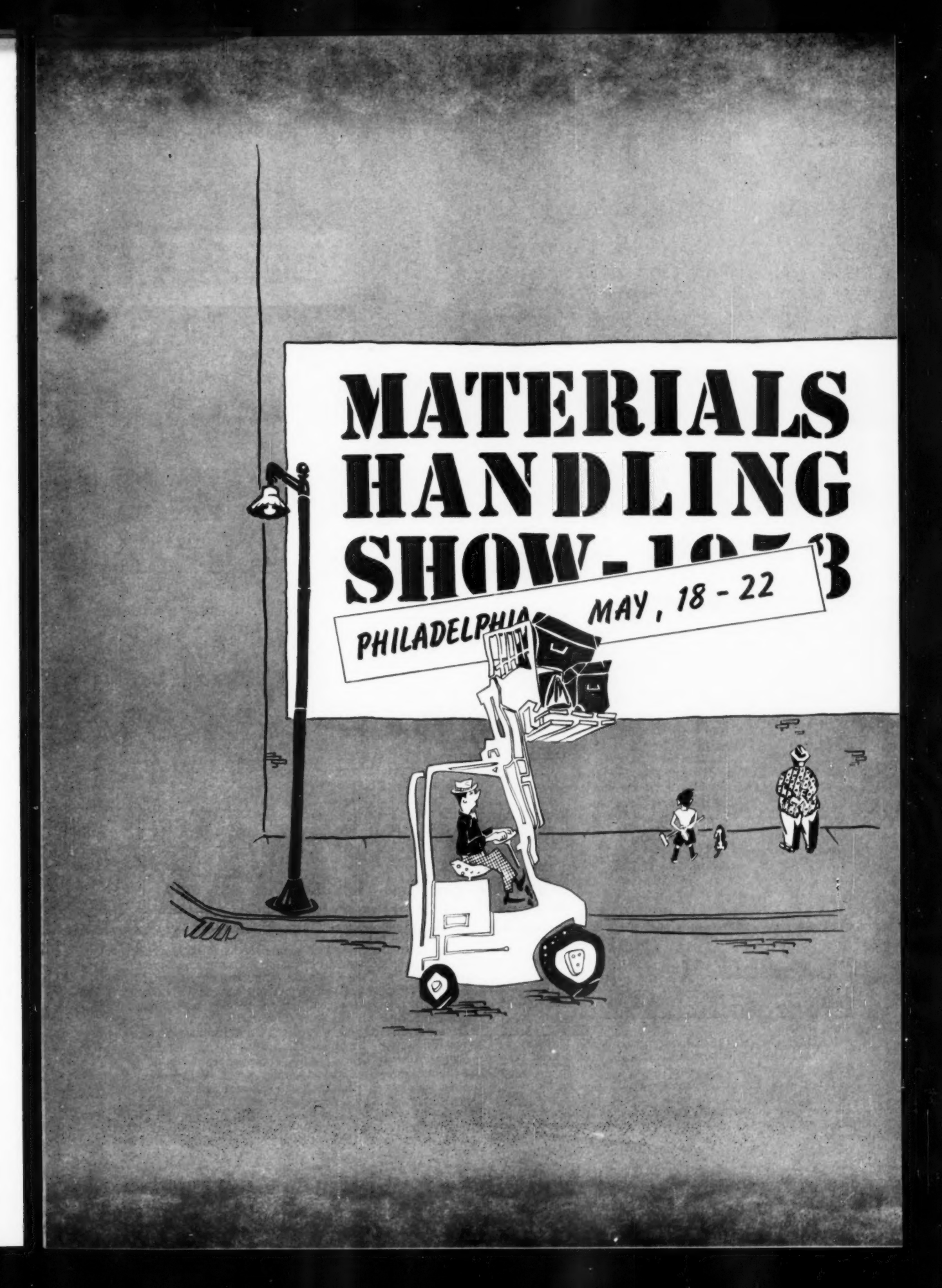
In using the pinch-off tool, apply enough pressure to completely close the tubing without damaging it.

When bending, check carefully just where the bends should start and make the bends slightly greater than desired, to compensate for spring in the tubing.

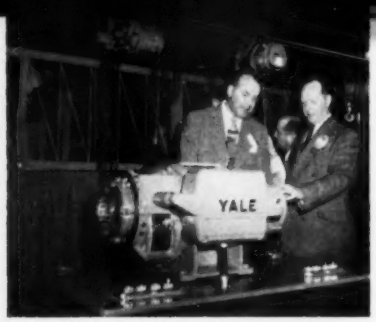
In refacing flare connection seats, remove only enough metal to provide a smooth surface.




Some special tubing tools are: Fig. 1, cutter; Fig. 2, reamer; Fig. 3, flaring tool; Fig. 4, pinch-off tool; Fig. 5, spring benders; and Fig. 6, lever bender


MATERIALS
HANDLING
SHOW-
PHILADELPHIA
MAY, 18 - 22

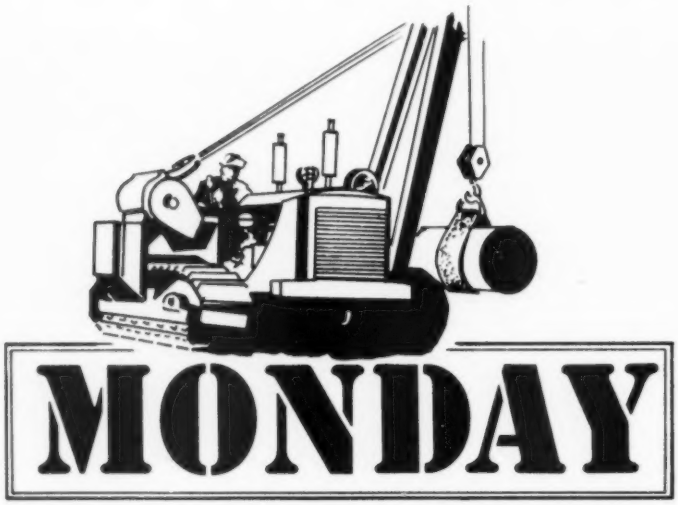
As the doors of the Philadelphia Convention Hall opened for the Fifth National Materials Handling Exposition, a group of visitors lined up at the registration desks to get their name tags. To find out what the visitors saw, Plant Engineering editors followed them through the aisles, viewing through the camera's eye the many exhibits at the Exposition. From a small caster to conveying equipment of all kinds to the world's largest tractor, visitors from industries across the nation got a good look at the variety of materials handling equipment that helps them keep material on the move. Plant Engineering's picture report follows




B. A. Muller, Chicago Tramrail, looks at cutaway of hoist model being discussed by C. O. Hedner, sales mgr, Hoist Section, Yale & Towne Mfg. Co.

Jack Morgan, Atlanta salesman; A. J. Collins, New York branch mgr; L. Sturm, demonstrator; and Tom Kinsella, Chicago br mgr, Mobilift Corp.

J. Avrigean and R. E. Grove, exec vice pres, of Ketchum, MacLeod and Grove, with C. B. Archibald, dist mgr, and L. W. Bennett, exhibit mgr, of Edison




# Materials Handling Progress in 1952

SO RAPID has been the recent evolution of material handling equipment—capacity limits extended, new equipment for new types of jobs and scores of new variations of existing equipment—that The Material Handling Institute has just surveyed its entire membership of 79 principal manufacturers and analyzed handling equipment trends of 1952 on an industry-wide basis.

The study shows one dominant direction of engineering development: —greater specialization of equipment.

In the field of trade practices, an important trend, widespread in other fields of manufacturing, was the leasing instead of selling, of certain material handling items. Belt conveyors and fork-lift trucks were offered for use on lease for the first time in 1952.

Dream stuff for the future includes radioactive isotopes for storage batteries. Radioactive gas instead of a liquid is being used in small storage batteries on an experimental scale. An explosion proof lift truck for the Armed Forces is being developed along several lines. Power may come from compressed air, liquid carbon dioxide or from a gyroscope within the equipment brought up to speed outside the explosive atmosphere and then taken in and worked by power taken from the gyro.

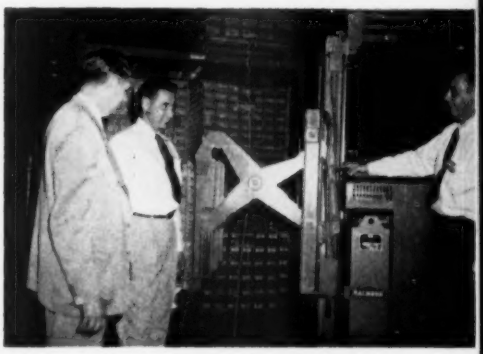
W. B. Dickey, ind sales mgr, and R. Rockwell, ind sales mgr, check weight of pamphlets on one of several scales displayed at the Toledo Scale Co. booth

R. Schell, company sales representative, operates pendant push button control on small hoist which was one item on display in the Harnischfeger booth

C. Peterson, adv mgr; R. M. Ward, Plant Engineering; H. T. Florence, pres, and A. F. Aujesky, sales mgr, of Cleveland Crane and Engineering Co.

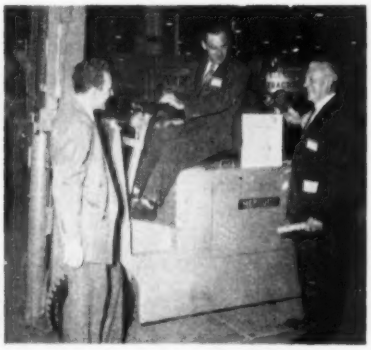
D. J. Heidinger, service supv; Walter J. Kirhofer, sales engineer; and E. A. Wikander, sales engineer, in front of the Richards-Wilcox Mfg. Co. booth

R. R. Beebe, sales engr, and R. S. McCauley, sales engr, examine portion of screw conveyor flight section on display at Standard Conveyor Company booth



W. L. Pearce, asst mgr, Parts Dist., Chevrolet, Flint, Mich.; with G. G. Raymond, Jr., exec vice pres, and D. W. Sprout, asst sales mgr, Raymond Corp.

B. F. Capps, sales engr; H. M. Wilson, product mgr; and J. G. Bryant, sales, of Wire Rope Sling Dept. of American Chain and Cable Co., discuss exhibit



E. Zapalik, adv mgr, talks with G. J. Gerhardt, sales engr, seated on truck, as L. Meissner, Jr., Pittsburgh rep, looks on. All with Mercury Mfg. Co.

S. Kurtz, sales engr, Chain Belt; E. Swansen, prod engr, and R. Poisson, asst sales mgr, of Baldwin Duckworth Div; J. Russell, adv dept, Chain Belt Co.

In the complete survey, these findings stand out:

**Fork-Lift Trucks**—Manufacturers of fork-lift trucks—both gas and electric—expanded their lines in the direction of increased capacity, higher lifts and more compact units. Both larger and smaller units were made available during 1952. Truck handling has invaded both heavier industry and lighter warehouse service.

At least two companies introduced compact lift-trucks for warehouse use in narrow aisles. These units are notable also for the high lifts attainable and for improved operator visibility. Extra long platform lengths appeared.

Both diesel-electric and straight diesel trucks were introduced during 1952.

With the increased use of industrial trucks over large plant areas, better methods of control and dispatching were developed. From simple, scheduled, pick-up routes, the systems devised ranged up to telephone call systems and elaborate two-way radio hook-ups.

**Fork-Lift Attachments**—New special attachments for fork-lift trucks indicated greater attention to the solution of specific problems for specific industries—paper, oil, cotton and such. Availability of special attachments broadens the scope of standard truck units.

Several barrel and drum handling attachments were designed that can be fixed to the forks in a matter of minutes. Two different sized drums can be carried at once with one new attachment.

Large rolls of newsprint can be handled expeditiously with a lift truck that picks up a roll from any position, turns it through 360 deg if needed, lifts it and stacks it.

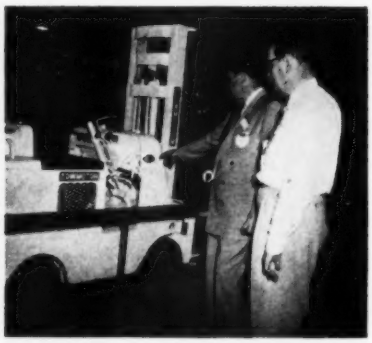
Judy McKenna and Ray Schaeper, RCA Victor, tell H. H. Beaudet, supt, Draper Corp., Hopedale, Mass., (seated on truck) how dispatching radio works

C. J. Schwarzer, Machine Electrification, Westinghouse, operates crane control as A. J. Danni and E. D. Reiber, Westinghouse engineers, watch results

C. T. Stuart, Industrial Specialist and C. E. Warner, Metalworking, both of U. S. Dept of Commerce, question J. P. Clark, Jr, Dings sales representative

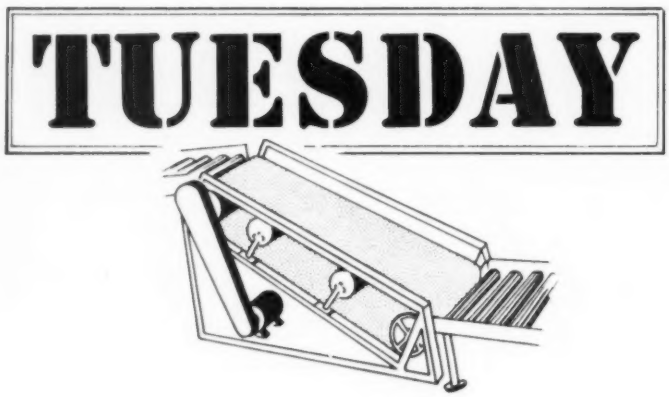
J. Biehner (center) demonstrates for A. J. Croze, Unistrut vice pres, T. C. Paul, visiting whse mgr, J. B. Stevenson, sales, E. A. Nickel, adv mgr

C. W. Heydecke, Public Service Electric & Gas and G. R. Slonneger, Hubley Mfg. Co., examine literature held by L. M. Eble (center) C&D adv mgr



W. E. Ripley, asst sales mgr, Towmotor, points to truck as he discusses company booth with Towmotor Corp.'s sales promotion and advertising mgr, Al Roth

O. M. Jones, Ames Co., Johnson City, Tenn., watches reciprocating vertical conveyor as Buschman sales mgr Otto Svoboda points out operating action




Recognizing that fork-lift equipment can often be used to advantage if it can be transported safely by light-duty elevators or shipboard cranes, the counterweight has been made detachable in one model so that machine and counterweight can be transported separately and then be reassembled.

**Batteries**—In addition to making refinements in standard items, electric battery manufacturers replaced metal with corrosion-resistant plastics to retain active material in certain battery designs. New lead alloys and grid improvements were introduced to give greater capacity and longer life.

**Overhead Cranes and Hoists**—Progress in overhead crane and hoist design was made in several phases of operation. Fluid drives have been adapted for overhead crane use by one manufacturer. A trend toward use of push-button control of even the less expensive hoists instead of rope-pendant control was noted. Many special lifting tackles were introduced such as double-hook cranes with hairpin attachments for handling coils of wire in liquid treatment tanks. A motor-driven expanding cable reel arbor was put on the market. All operations, including the arbor expansion, are controlled from a pendant push-button station. A double hoist turns the reel.

An overhead crane with five separately controlled movements answered a particular problem involving handling coils of wire in close quarters. In addition to hoist, trolley travel, bridge travel, two hoisting motors permitted tilting the load. The hoisting element of the

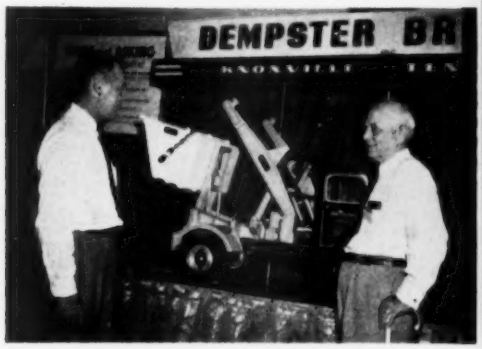
Philip C. Homrighausen, dist rep for the Buda Co., discusses lift truck features with R. M. Scott, sales mgr, who demonstrates control lever operation

P. F. Morris, Rocky Mount Mills, Rocky Mount, N. C., reads literature held by L. J. Johnson, Mathews asst sales mgr, with H. E. Helling, adv mgr

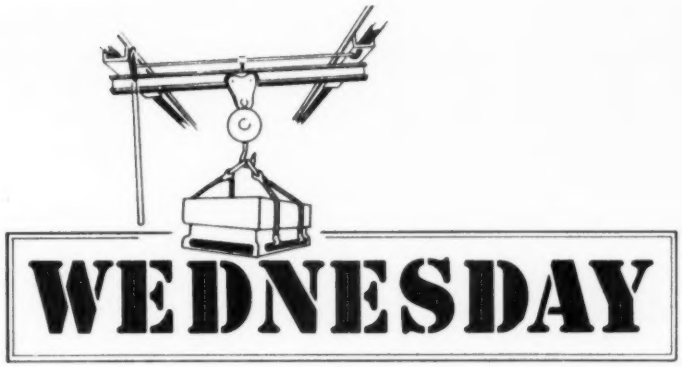
E. H. Doerger, adv mgr, James A. Farrell, secy, (holding hoist hook) and A. S. Wrobleski, sales mgr, all of American MonoRail Co., at hoist display

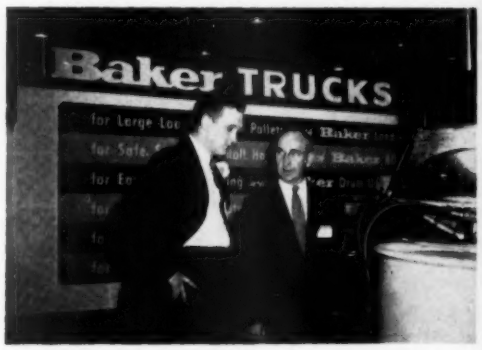
St. Bernard Ch. Major v. Neu-Habsburg holds center stage as H. G. Manley, J. C. Sheahan and Jim McCullough, Gould-National adv mgr, meet in booth

H. S. Germond, treas, Revolvator Co., demonstrates operation of company's hand truck with pallets to V. B. Gleaves, supt of stations, Frisco R. R.




Model of Dempster unit is highlight of booth. Jack Dempster, dir of field engineering, talks with George R. Dempster, company president, during Exposition




Tom Willson, adv mgr, Industrial Truck Div, Baker-Raulang, discusses booth layout with E. W. Sankey, vice pres, engineering, of Baker-Raulang Company

crane is mounted on a circular track attached to the trolley that permits rotation through 360 deg as the fifth motion.

A safety switch in one installation permits horizontal travel only when the load is raised to the highest position to clear obstructions along the route travelled. A new, safety electrical conduit was introduced that is protected against accidental contact on three sides by a plastic cover. A graphite shoe riding inside the cover provides the power contact. Tests indicated that, as well as being safer, the graphite shoe gave longer life of both shoe and rail.

**Pallets**—Wider use of pallets was aided by the introduction of many different kinds of pallets. Inexpensive, one-time shippers were made available as well as combinations of wood and metal, all-metal, all-wood for multiple trip, returnable use. A lightweight, one-piece plastic pallet is under development.

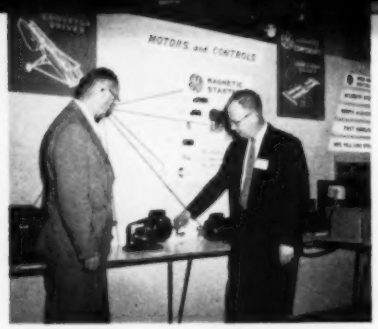
Another type of pallet found useful applications because of rollers fixed integrally on its bottom. Moveboxes and bins for specialized use appeared on the market. Side-opening metal boxes with controlled-discharge side gates permit faster emptying.

A compact, upright, rotary stand to hold glass containers was designed to solve the problem of making many small parts readily available and visible.

**Railroad Car Loading**—The problem of bracing loads in railroad cars has occasioned considerable study for many years. The latest is a railroad car with a transparent plastic side so that effects of switching, humping

F. Liechti, prod mgr, operates hoist while C. E. Miller, dir, dist sales; C. B. Hayman, field engr; G. A. Mitchell, adv mgr, Manning, Maxwell & Moore, watch

J. A. Holan, asst sales mgr, Elwell-Parker and O. R. Heidenrich, Pittsburgh rep of Elwell-Parker watch the operator demonstrate a company truck




C. P. Hamilton, application engr, examines model as C. H. Caldwell, sales engr, operates speed control regulating crank of motor drive at General Electric booth

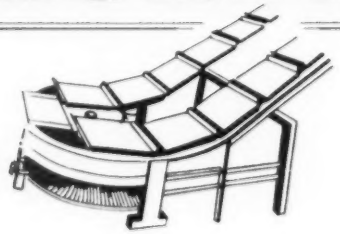
F. Patterson, sales; W. R. Thomas, vice pres; and P. Anderson, asst sales mgr, all of Thomas Truck & Caster Co., grouped at one of company's trucks

L. B. Snyder, sales rep, holds section of pipe used in Garlock Packing display as C. F. Palmer, Jr., Philadelphia district manager looks at the packing

G. Sladek, engr, watches with A. Huhner, sales rep, as O. Lund, sales mgr, operates the controls of one of the many Barrett-Cravens Co. trucks

G. D. Billings, sales rep, G. H. Tennant Co., points out the many features of one of company's power sweepers to group of interested Exposition visitors

# THURSDAY



and impacts can be seen without opening the car and can be studied more readily. One railroad car so equipped is also being used to instruct shippers on proper bracing and loading.

A new portable bulkhead introduced in 1952 has the advantage of being reusable. It requires no special tools for installation or removal.

**Crawler and Truck Cranes**—New attachments for crawler-mounted and rubber-tired cranes and power excavating equipment permitted handling special jobs with basic standard equipment. A special attachment was designed for unloading pulpwood rack cars. A parallelogram arrangement keeps the pushing plate perpendicular to the log ends throughout the cycle of movement. A scoop-shovel attachment designed for low head-room was found to be useful in underground mining, where materials handling is a major factor.

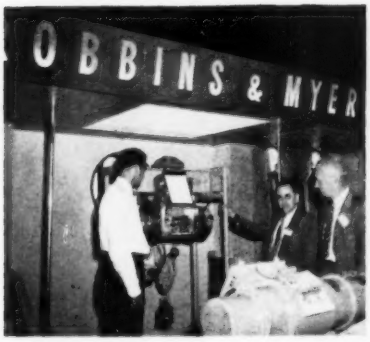
More manufacturers of crawler and truck-mounted cranes and shovels adapted hydraulic and magnetic clutches to this type of equipment.

**Belt Conveyors**—Although standard rubber conveyor belts continued as the workhorse of the bulk material handling industry, specialiy designed belts excited interest in several industrial fields. A belt with rubber lugs molded to the sides was put in service in a food canning factory to reduce cooling time for cans of food. The lugs jiggled the cans in a stream of cold water as the cans were carried up on the belt to labelling and shipping. Other special belts with a wide variety of shapes molded into or on their surface indi-

D. E. Ellzey, Dwight E. Ellzey Co., Birmingham; and R. T. Walter, dist mgr, Wilshire Power Sweeper Co.; pose with "Miss Wilshire" at the display

C. Bontems, sales, Bassick; W. M. Bennett, sales, Bennett Equipment & Supply Co., Toronto; with A. J. Israel and J. B. Funk, sales engrs of Bassick Co.

D. L. Gregory, tractor repair foreman; sales engrs W. M. Ely, R. H. Maurer, and G. V. Cripps, (pointing at cutaway model) of Electric Storage Battery Co.

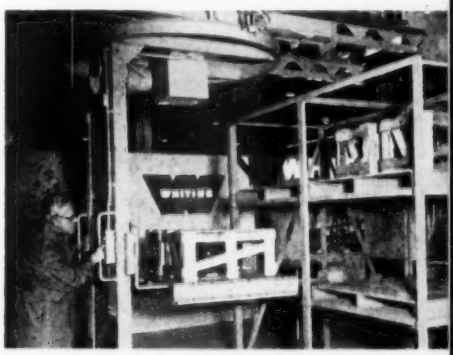



B. Kempton, sales engr; R. Ober, asst chief, engineering, Hoist Div.; with Albert Kreh, New York sales rep, Robbins & Myers, at cutaway hoist

G. Furnival, pres of Furnival Mach. Co., views the newest model along with John R. Titlow, sales mgr, Industrial Truck Division, Clark Equipment Co.

A. Foster, vice pres, gen mgr; J. J. Pugh, dist rep; and W. R. Maguire, pres, Walter R. Maguire Co. with Tom Hanson, Editor of Plant Engineering

# FRIDAY



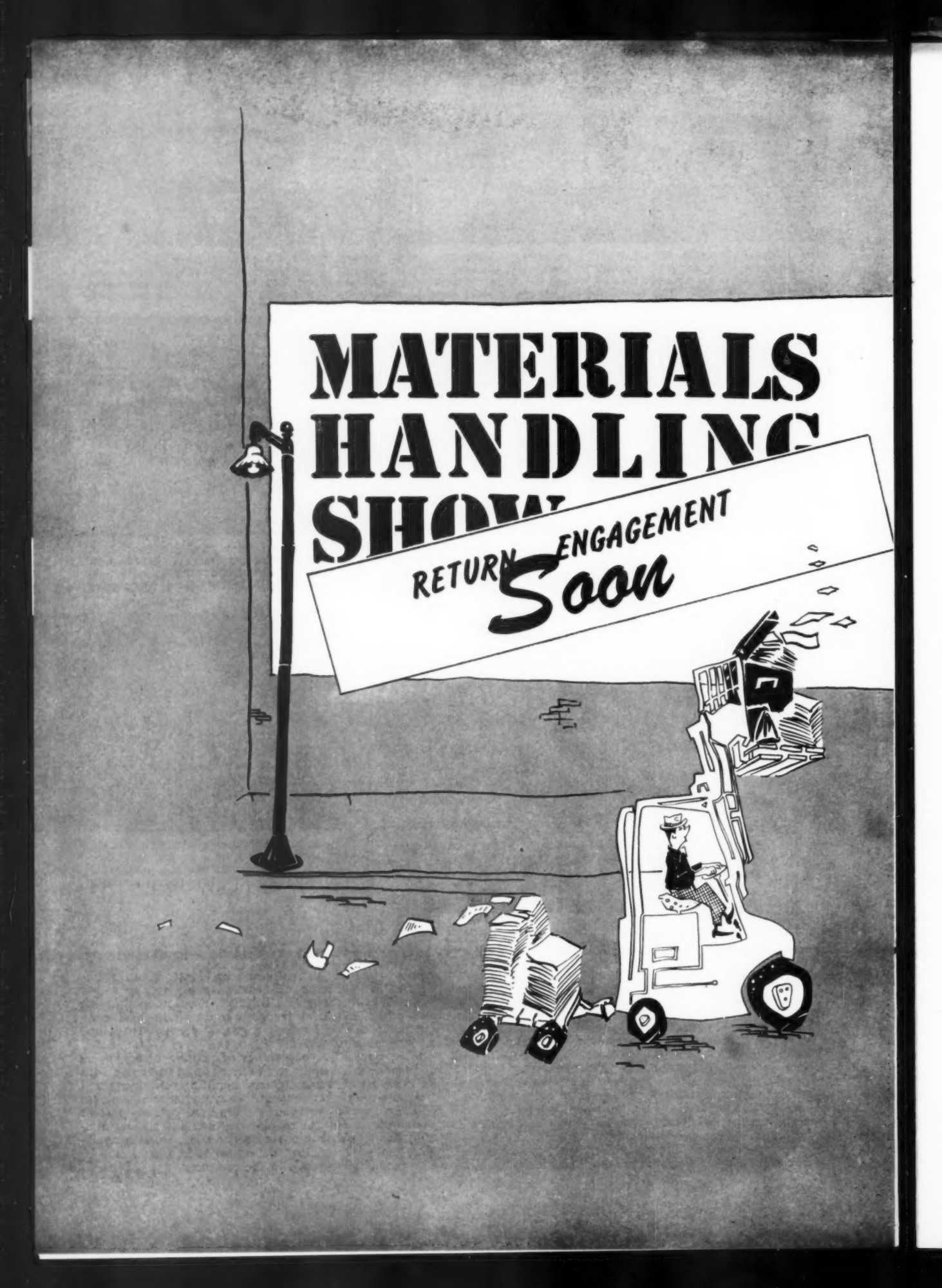

H. S. Chillas, asst adv mgr, demonstrates how containers can be taken from storage with stacker crane setup featured in the Whiting Corp. booth

cated the importance of this trend. Originally a special belt, the rough top belt for carrying packages up an incline, is now a standard item. There was more interest in metallic conveyor belts such as stainless steel, even for bulk handling.

**Vertical Transportation**—Although the trend toward new single-story plants made vertical transportation less important, electronically controlled elevators for freight and passenger transportation increased the speed of vertical transportation equipment in older buildings. Self-levelling, power-doors, and more attention to integrating elevators to the over-all plant system aided in getting increased production from older buildings.

**Safety**—One of the tenets of material handling engineering is that the proper practice of material handling will promote safety and reduce accidents. Manufacturers in this field have incorporated many specific safety features in their equipment. Better vision in fork-lift and other industrial trucks introduced in 1952 contribute to safety. Protective guards prevent truck operators from injury.

**Education**—The cooperation of manufacturers, users and teachers is helping to produce young engineers with a firm grasp of basic material handling techniques and the proper use of equipment. Many engineering colleges offer courses in material handling subjects as part of the curricula of both regular daytime and special evening classes. With more properly qualified men available, material handling departments in plants can be set up to show a profit to the company.


MATERIALS
HANDLING
SHOW
RETURN ENGAGEMENT
Soon

**How an Editor Played a Vital Role in the Period Since Hiroshima When Research Worked to Prove—**

# Atomic Power Just Around the Corner

**By RICHARD H. MORRIS, Editorial Director**

EIGHT YEARS AGO the President announced the successful atomic bomb drop on Hiroshima. This told a startled world that the problem of nuclear fission had been solved—and the end of the war not far away.

Late in May the Atomic Energy Commission released the Industrial Report on Power Reactors. This told an impatient world that the application of nuclear fission to industrial use had been solved — and atomic power not far away.

Hundreds of editors will reprint all or portions of the report which is readily available in complete form from the Government Printing Office. Thousands of pseudo-experts will interpret it. An equal number of imaginative artists will draw fantastic illustrations. In this highly specialized field, not fully explored, filled with technical jargon and hedged in by rigid security, few know the real story and still fewer can tell it.

One of these very few is Andy Kramer. He prepared the AEC reactor release. He is a member of the Advisory Committee with top security clearance. He has visited and studied at first hand the work at AEC Laboratories and contractor sites. He has discussed nuclear physics with scientists, as an equal and in scientific terms.

As an experienced editor he has the rare ability to translate scientific language into engineering terms and project laboratory work into practical accomplishments. As an experienced power engineer, he knows what the work in the reports means to industry, and how close atomic power is to being a commercial reality.

The report shows that atomic power is practical, commercially sound and feasible. A start on construction is contingent only on security and legislative restrictions which are not insurmountable. A detailed abstract of the report would add little to engineering knowledge because the complete report is readily available to everyone.

Instead Kramer has, in the following pages of this special section, drawn upon his unique background and experience to give an original explanation and interpretation of the report and the work. Because of his familiarity with the unclassified version as well as with the original classified material he has been able to write a report that does not duplicate the official document but will help to understand the significance of the full report.

Kramer's lifelong interest in the scientific and practical aspects of nuclear energy was kindled by amateur radio in the old spark days long before World War I. A series of articles, started in 1926, were later collected in book form, the first of several of his books to be published. Since the end of World War II he has been in demand as a speaker before military, engineering and non-engineering groups across the country.

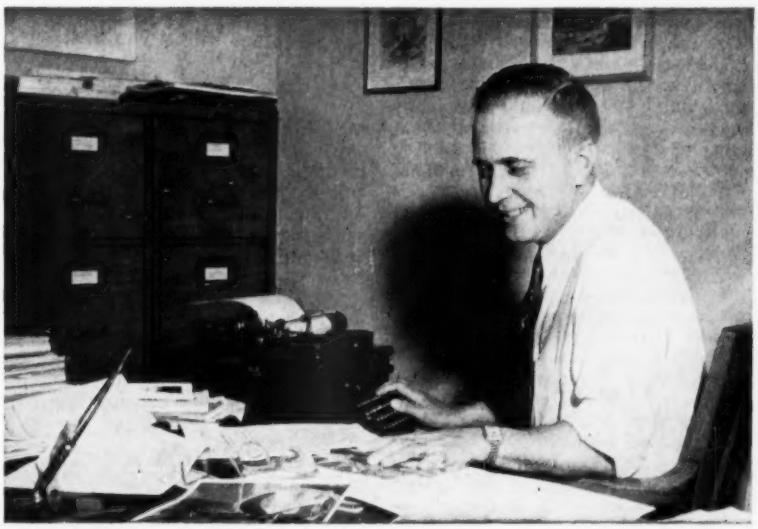
As early as 1935 he made drawings outlining an atomic power plant. As the field developed from the first carbon pile at the University of Chicago to the atomic explosions over Japan, he followed the work closely. After the President's announcement, Kramer wrote a series of articles explaining the development work on the atomic bomb. This was the start of the magazine ATOMICS, first published as a section in the magazine for five years.

In 1946 he received an appointment to attend the Atomic Bomb Tests at Bikini. These tests he reported in a series of dispatches direct from the scene. In 1947 he was invited to Oak Ridge National Laboratory for the Heat Transfer Conference, to study the problems of heat transfer in relation to the development of nuclear reactors.

In 1952 he was appointed a member of the Advisory Committee on Industrial Information to the AEC, a group of experts formed to examine the work at AEC sites, identify information of value to industry, and advise on declassification.

Last fall, as a member of the committee, he was appointed as one of a two man task force (with S. A. Tucker, publications manager, ASME). In this assignment, they reviewed the work and voluminous reports of the four groups of companies engaged in the development of atomic power plants, and prepared an unclassified summary for release to industry.

This work had hardly been completed when he was delegated to go to Hanford and Arco, investigate the reactors at these two sites, and recommend for declassification of reactor data and material which would be of value to industry.



**ABOUT THE AUTHOR** — Andrew Kramer, noted industrial editor and long recognized as an authority in the field of nuclear physics. Because of this dual experience he was appointed power industry representative on the AEC Advisory Committee. In this capacity and as one of a team of two, he reviewed the voluminous research reports and prepared the versions just released by the AEC. At present he is in the Northwest with another small AEC task force reviewing the work at Hanford and Arco to consider possible declassification of reactor data. In addition to his AEC activities, Andy is editor of POWER ENGINEERING, the first editor of ATOMICS and consulting electrical editor of PLANT ENGINEERING.

# Basic Facts

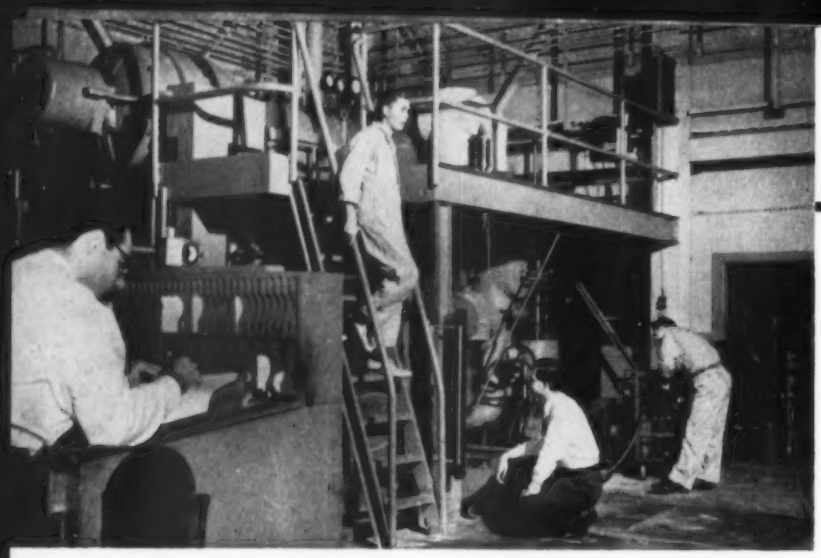


Fig. 1. View of the electric power equipment associated with the new liquid-fuel nuclear reactor at Oak Ridge National Laboratory. This reactor successfully produced electric power late in February

SINCE that historic summer day, early in August 1945, when the news of the first atomic bomb explosion over Hiroshima swept around the world, people in all countries have regarded the advent of atomic energy with mixed apprehension and enthusiasm. For like many other human achievements, nuclear energy has two faces, one good, the other evil.

We know the evil. At Hiroshima, in one blinding, searing flash of light, in one scorching wave of heat, in one terrific surge of blast—in one silent, sinister, sensationless burst of radiation, between 70,000 and 80,000 human lives were snuffed out. That one bomb killed three times as many people as all the air raids on London during World War II. So there is no question about the evil face of nuclear energy.

The good face of nuclear energy has been slower in revealing itself, yet from the beginning most everybody has known it was there. The story goes back a long way—some 25 centuries in fact, to when Democritus in ancient Greece first propounded the idea that all matter is made of minute, finite particles. They were, in his native Greek tongue, *a-tomas: not cuttable*. Thus, the name atom was born, and thus, the story of atomic energy begins, not at Cambridge or Chicago, or Hiroshima, but in Greece, five centuries before the dawn of Christianity.

From that point—from Democritus' inspired arguments to the explosion of the atom bomb over Hiroshima is a long road, a fascinating highway marked with great names—Bacon, Newton, Dalton, Roentgen, Curie, Einstein, and others; a highway with an ever broadening horizon but beset with obstacles, blind sideroads and confusing detours, but one which dogged persistence and infinite skill and patience successfully negotiated. It was in January 1939 that the scientific world was startled by a "letter to the Editor" in *Nature* by Lise Meitner and Otto Frisch announcing the achievement of nuclear fission.

Nuclear fission is a high sounding term but to the layman it means simply splitting the atom. Now, the atom had been split before January 1939, many times in fact but always through the application of far greater energies than was released. The startling thing about the Meitner-Frisch announcement was that the fission of uranium was accomplished by the capture of neutrons, not by the brute-force bombardment by high energy charged particles, as had been the method in all previous experimental work. As Dr. J. G. Feinberg says, everybody talks about the atom, yet it is the neutron which is the real hero—or villain, depending upon how you look at it.

### What Is a Reactor?

The neutron made possible the chain reaction which scientists had been searching for. The principle was simple. When an atom of uranium captures a neutron, it splits, releasing enormous energy, and at the same time one or more neutrons are ejected. These released neutrons are capable of splitting other uranium atoms, and so a chain reaction is set up. If the chain reaction is fast enough, and uncontrolled, we have the atomic bomb. If it is controlled by slowing up the neutrons between each fission, we have a nuclear reactor.

A nuclear reactor is a machine for converting nuclear energy into heat energy that can be used for useful purposes. The first nuclear reactor ever built went into operation on December 2, 1942 at the University of Chicago. It operated at a rate of ½ watt—a small but safe beginning. Later, on December 12 the intensity was run up to 200 watts. Today, reactors operate at thousands of kilowatts.

Basically reactors are not complicated. Practically they are large, expensive gadgets. Their construction and operation involve enormous difficulties. Well then, if they are so troublesome, why build them at all? A fair question.

Reactors can be used for several purposes. Basically, all reactors produce three things—neutrons, fission products, and heat. You can use the neutrons for creating new materials. By a process of transmutation of elements the neutrons can be used in the reactor to produce new and valuable materials such as plutonium for atomic bombs. So the neutrons themselves have cash value. The large amounts of heat generated in a reactor may, or may not, have cash value, depending on how efficiently we can extract it.

The best known examples of reactors utilizing neutrons for transmutation are the Hanford reactors in the State of Washington. These are production reactors, used for making plutonium for our atomic bomb stockpile. Of course large quantities of heat are also generated, but the temperature is so low that the heat cannot be used practically. Its removal is strictly a cooling operation; it is dumped into the Columbia River.

It is obvious, however, that if we could run the temperature of these Hanford reactors up somewhat, and begin to extract the heat at a temperature level enabling us to generate steam and then mechanical or electrical power, it is conceivable that we might get a by-product credit for the power.

Now, plutonium is itself a nuclear fuel. It splits by neutron capture just as does uranium 235. Since more than one neutron is released in each fission, it is conceivable that a reactor producing heat for power could, at the same time, produce as

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**Write the Editor on your company letterhead for a copy. Copies will be sent free as long as they last. Copies are also available from the Supt. of Documents, Gov't Printing Off., Washington 25, D. C., at 25 cents each. The title is "Report to U.S. Atomic Energy Commission on Nuclear Power Reactor Technology."**

# About Industrial Power Reactors

**To evaluate the Reports on Power Reactor Feasibility just released to The Atomic Energy Commission it is necessary that engineers have at least an elementary knowledge of nuclear reactor principles. This brief discussion gives them these basic facts together with some of the history back of the reports**

By ANDREW W. KRAMER

much or even more new fissionable material than we *burn*. This is called *breeding*.

There is nothing *perpetual motion* about breeding. We are merely converting non-fissionable material (U-238) into fissionable plutonium.[1] Consider the case shown in Fig. 2. This shows the process of breeding using *plutonium* as fuel. The number of neutrons emitted per fission

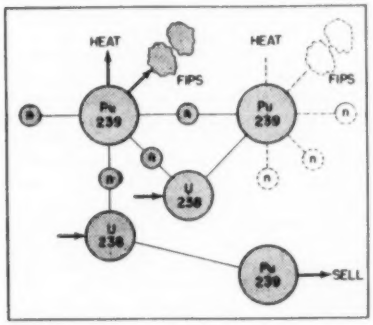


**Fig. 2. Diagram of the fission of plutonium showing the principle of breeding**

of plutonium has been released by the AEC, and is given as 3.0 ± 0.1.

Thus, the number of neutrons which are spent per fission can be added up as follows:

1 neutron to keep up the chain reaction and cause fission.
1 neutron to transmute a fertile U-238 atom to Pu-239 to replace the fissionable Pu-239 atom just burned
X neutrons which go to parasitic, structural and leakage losses

---

2 + X Total neutrons spent in fission

Thus, the net number of neutrons per fission of plutonium 239 is about 3-2-X, or 1-X neutrons per fission available to transmute additional U-238 to Pu-239, which we may extract from the system and sell. The salable plutonium can be used to provide the initial charge for new stationary or mobile power plants or for nuclear weapons.

It is not feasible, here, to discuss the technical and economic problems involved in breeding, which center around making X as small as possible, but there is good reason to believe that breeding is possible. Much research and development has been expended in that direction.

It should be quite obvious that if X is greater than unity, then breeding is not possible, and part of the U-238 must be left behind unburned. If, on the other hand, the losses X can be kept much less than 1 and near 0, then we can show that

1 gm Pu-239 + 2 gm U-238 = 1 $kw_e$-yr + 2 gm Pu-239 (of which only 1 gm is excess and salable) + 1 gm fips (fission products)

or, cancelling

2 gm U-238 = 1 $kw_e$-yr + 1 gm Pu-239 (excess and salable) + 1 gm fips

In this equation the kilowatt-year of electricity ($kw_e$-yr) is based on about 36% thermal efficiency.

*This is the fundamental equation for the nuclear power business.* It is illustrated schematically in Fig. 3. At $35 per pound the two grams of U-238 burned after converting to fuel would cost a negligible fifteen cents. The kw-yr of electricity is worth $44 at 5 mils per kwhr. The gram of plutonium which we might sell is today certainly worth more than $20 to $40, and is ultimately probably worth somewhere around $20 to $40 for a very long term.[2] This significant additional revenue is a second economic advantage for the breeder type of reactor. The two revenues per kw of capacity per year determine how much we can spend for plant investment and operating costs. For an oversimplification, by equating the revenue from plutonium to the operating costs and capitalizing the fuel savings one can arrive at a number between $200 and $300 as permissible investment for the reactor and all its appurtenances up to the steam throttle valve.

As already mentioned, if X is greater than unity, breeding is not possible. If, for example, X is 1.2, than 0.8 atoms of Pu-239 are manufactured for each one burned. It is relatively simple to show that in this case 4 times as much of the more abundant U-238 can be burned, as we have U-235 or Pu-239 to start out with. This more modest but not negligible achievement, considering the World's uranium resources, would give us an energy resource almost equal to the known coal reserves. In view of the tremendous advantage of breeding it is not strange that at least one public utility and chemical plant group is, as John Menke,[2] put it, "headed for breeding or bust."

In view of these facts and other available data on reactor technology it is quite understandable that elec-

[1] Only a very small proportion of natural uranium is fissionable. Natural uranium consists of 97.3 per cent U-238 and 0.7 per cent U-235. Only the seven tenths of one per cent U-235 is fissionable. The U-238 can, however, be converted to Plutonium (Pu-239) by neutron absorption, and the resulting (Pu-239) is fissionable.

[2] The calculations and estimates here given together with the illustrations Figs. 2, 3, and 4, are based on a conference paper presented at the 1953 Winter Meeting of the AIEE, by John R. Menke, President, Nuclear Development Associates, Inc., White Plains, N. Y.

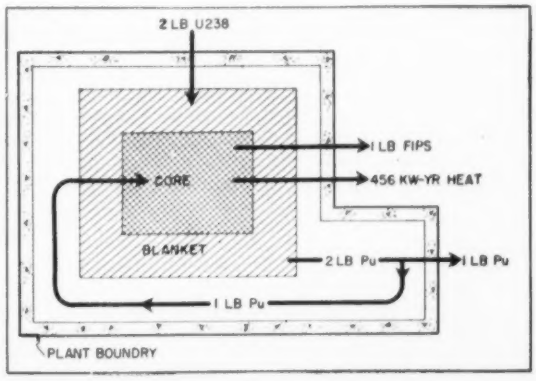


**Fig. 3. This diagram of a breede: reactor shows how 2 lb of non-fissionable uranium is converted into 465 kw-yr of heat and 1 lb of fissionable plutonium**

tric utility as well as chemical companies should have exhibited an active interest in developing nuclear power plants almost from the beginning. Despite the fact that present legal restrictions prevent private organizations from possessing uranium, several groups of public utility and chemical companies have been engaged in studying and working out the practical and economic elements of atomic power plants, for a number of years. To aid in this work, selected engineers and scientists of these companies were given the opportunity to study classified material and were given training courses at several of the National Laboratories, where they had access to basic classified data underlying the work of the Reactor Division of the AEC. Each group, therefore, approached the problem with the same basic understanding in the light of their specific knowledge and imagination.

Early last fall these four groups of companies completed their preliminary designs and issued reports on their work to the Atomic Energy Commission. These reports are of necessity highly classified since they involve data on reactor technology and fissionable material production of value to potential enemies.

It was also true that these reports contained a great deal of information not of a classified nature that would be of immense value to power engineers and engineers generally.

Early last December, therefore, the Advisory Committee on Industrial Information of the Atomic Energy Commission appointed a small sub-committee to make a detailed study of the reports of the four groups of companies with the object of recommending portions of these reports for declassification and subsequent release to industry. Accordingly, such a study was carried out in late December 1952 and January 1953, and the sub-committee's report was submitted to the Atomic Energy Commission in February of this year. This declassified version has now been released in the form of a printed book. Since even the declassified version is far too long and detailed to present in a monthly publication, we present herewith a general description of the four reports so that readers may determine whether or not they are interested in the complete reports which are readily available from the Government Printing Office at Washington, or from us as explained in the notices on these pages.

The significant feature about these four studies is the almost complete divergence in the methods of attacking and solving the problem of nuclear power development. All groups, of course, had the same objective; the development of systems and methods for the economical production of power from the heat produced in nuclear reactors, yet all four groups came up with significantly different solutions. The first three reports as listed above describe specific designs involving considerable constructional detail. The last report, that of the Detroit Edison-Dow Chemical Co. considers the problem in general and economic terms, all of which are of extreme interest, but it does not attempt to outline specific plant designs.

### Value to Industry

The value-to-industry elements in these reports lies not in the detail of reactor design or construction, but in the coordination of the reactor with the suggested arrangements for producing electric power. While intimate knowledge of reactor design principles and methods of operation would be helpful to the power engineer, he is less concerned with specific details of reactor design than he is with the temperatures at which they can operate, the types and characteristics of coolants used, quantities of flow, pressures, sizes of piping and ductwork needed, the types, sizes and capacities of pumps, fans, heat exchangers and other auxiliary equipment involved. He is vitally interested in the specific details of plant arrangements, and, of course, in the economics of proposed plants. It is further necessary for the power engineer to understand thoroughly the nature and operating characteristics of reactor control systems since the control of the reactor must be integrated with the control of the generating station as a whole. He is vitally concerned with the operating temperatures of the reactor elements, with the heat release, and the heat transfer characteristics of the coolants.

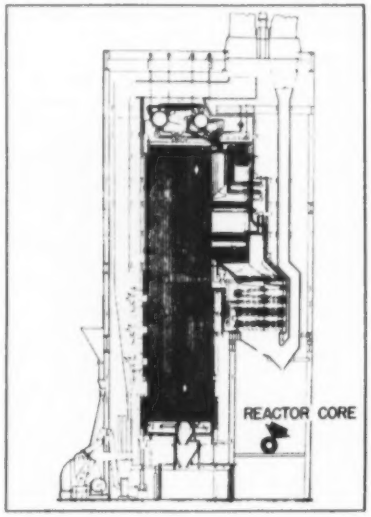


**Fig. 4. Nuclear reactor core compared with a modern reheat boiler of the same power rating**

There has been considerable misunderstanding and misconception, among power engineers, concerning the nature of atomic power plants that might be built. From long familiarity with existing plants and thermodynamic cycles they assume that nuclear power plants will have to operate on the same high temperature, high pressure steam cycles that characterize modern fuel-fired plants.

Even a cursory reading of the edited reports will indicate that this is not so. All plants involve the use of conventional steam turbines supplied with steam from heat exchangers (boilers) which, in turn, are supplied with heat from the coolant flowing through the nuclear reactors. Note, however; in only one instance does the design of these plants involve steam at a pressure higher than 485 psig nor at temperatures higher than 750 F. Indeed, one of the plants (Monsanto-Union Electric) is designed for steam at 165 psig, saturated. Even at this low pressure the power output called for is 220,000 kw in two turbo-generators of 110,000 kw each!

These steam pressures and temperatures are something for the power engineer to contemplate since they are very much lower than those used in our modern high thermal efficiency plants. If nuclear power plants come into use, we may have to go back to pressures and temperatures which were in use 20 and 30 years ago. This is not, necessarily, a foregone conclusion, however, since, as one study indicates (Detroit-Dow) reactor operating temperatures as high as 1500 F might be utilized in the case of certain types of proposed reactors. Assuming, however, that the lower pressure-temperature range prevails at least in the early development of atomic power, it will result in the use of much larger (physically) equipment than is used at present. In the use of the liquid-cooled plant proposed by the Commonwealth Edison-Public Service of Northern Illinois group, each of the three 80,000-kw turbo-generators comprising the plant will need four 35,000 sq ft condensers. This amount of condenser cooling surface ordinarily would be sufficient for a 200,000-kw turbine at conventional steam pressures.

The steam equipment including the piping will therefore be much larger in physical dimensions in the atomic power plant than it is in the conventional high-pressure steam plant. The thermal efficiency also may be lower but where plutonium production is involved, the question of thermal efficiency becomes of secondary importance, and power engineers may have to revise their ideas concerning the relative importance of efficiency in the design and operation of atomic power plants.

# Industrial Study Groups Report on Power Reactor Feasibility

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THE MOST SIGNIFICANT FACT concerning the studies on Power Reactor Feasibility by the four industrial groups, as indicated in the preceding article, is the divergence in the methods of attacking and solving the problem. The reports show how four groups of engineers, starting from scratch but with a common objective, working independently, arrive at very different solutions. This knowledge should inspire other engineering groups to tackle the problem in still other ways and thus, ultimately, bring about the development of practical and economically competitive nuclear power plants.

We *will* have nuclear power plants, make no mistake about that. Until recently, power engineers generally have not been overly enthusiastic about atomic power. While they did not completely discount the development of nuclear power plants, they felt they were a long way off. As these studies show, however, the generation of electricity from nuclear energy is much closer than most engineers could have foreseen even two years ago. Instead of discounting the possibility of developing atomic power plants on an economic basis in the foreseeable future as they were inclined to several years ago, utility engineers, now, are actively interested, and many other utility companies besides the four groups issuing these reports, are actively engaged in the development of atomic power plants.

Many of the large manufacturing companies also are actively engaged in the construction of facilities for the manufacture of atomic power equipment. The quantity of industrial *know-how* that is accumulating is almost beyond comprehension. New methods, new principles, new techniques, and new concepts are being uncovered every day. A vast new literature is building up, much of it, unfortunately, still classified but the time is coming when most of this will be available to industry. Nothing can stop it. The pressures from all points of our economy will force these techniques to be revealed. A fuel with a potential heat value of 40 billion Btu per lb simply cannot be ignored.

Lest you be concerned about the supply of fissionable material in the World, don't be misled by the dire predictions of those who merely assumed that the uranium deposits are extremely limited. True, they are not abundant in terms of billions of tons, as for coal, but you don't need much uranium to run a power plant. As Dr. Hafstad has pointed out, there is actually more energy in a ton of granite, that is, in the small amount of uranium in granite, than there is in a ton of coal. Of course, it would be difficult and inordinately expensive to extract it, but it is there. Lately, there has come into use a new term for expressing large quantities of heat energy. This term is the Q, equal to $10^{18}$ Btu, a very large number. In terms of this large unit, the known coal resources of the world are estimated to be between 36 and 70 Q. On the same basis, and assuming that breeding is possible, the uranium resources of the world are estimated to run from 1000 to 1700 Q.

In view of these facts it is quite understandable that the electric utilities should be interested in the development of atomic power. It is even more understandable after one has studied the reports of the four industrial study groups.

In the studies, each group developed at least two designs, one permitting immediate construction, and another involving more development problems but having greater future promise. For the sake of comparison these various designs can be described briefly as follows:

Commonwealth Edison—Public Service Co. of Northern Illinois

Two conceptual designs, both using natural uranium as fuel.

A. 350 megawatt (heat) 60 megawatt electric power, helium-cooled, graphite moderated reactor.

B. 1064 megawatt (heat) 211.5 megawatt net electric power heavy-water-moderated and cooled reactor.

Total estimated costs, $40,000,000 and $118,000,000, respectively.

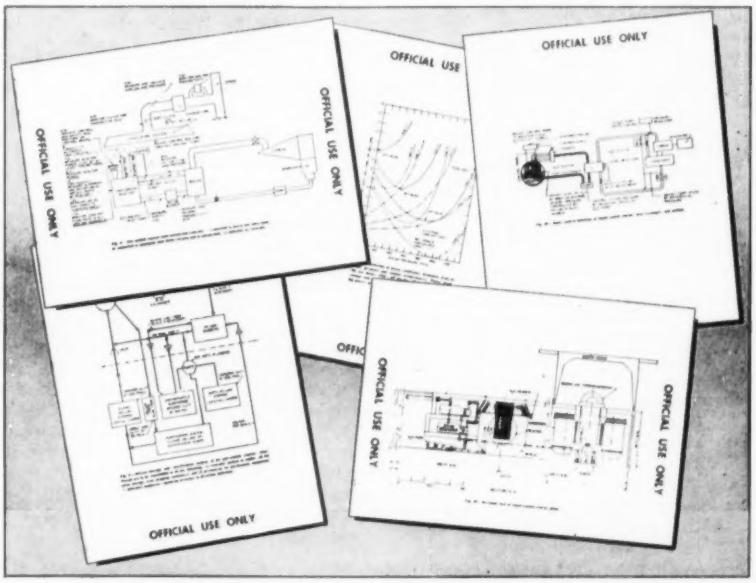


**Fig. 1. Pages from the official report showing the character of the illustrations**

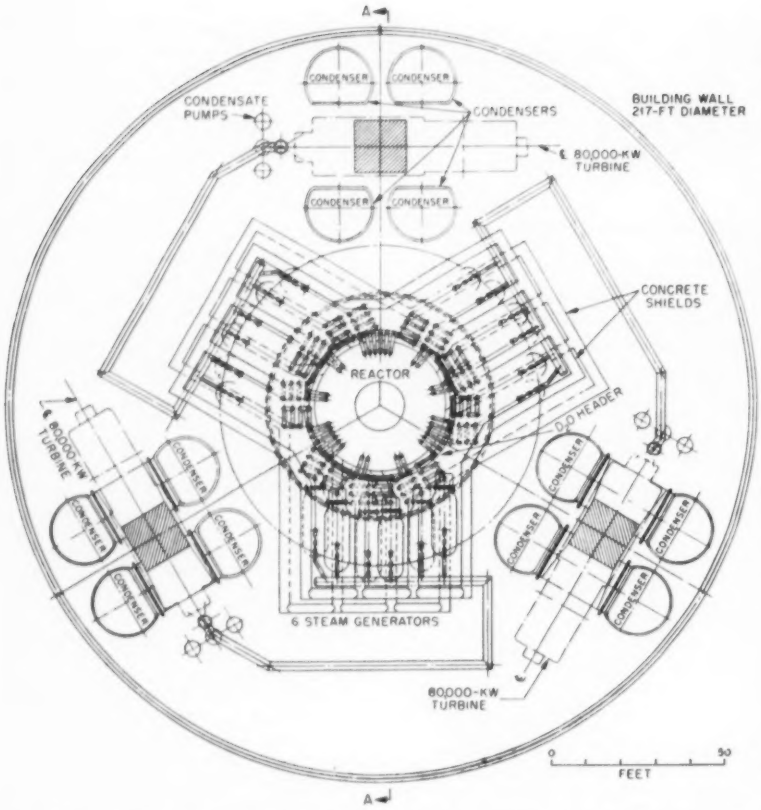


**Fig. 2. Plan view of the liquid-metal-cooled reactor plant proposed by the Commonwealth Edison-Public Service Co. of Northern Illinois group**

Pacific Gas & Electric Co.—
Bechtel Corp.

A. Light water-cooled, thermal reactor using natural uranium fuel rods. Reactor to be cooled by the flow of $H_2O$ through steam generator. Fuel rods to be surrounded by $D_2O$ moderator.

B. A liquid-metal-cooled *fast* reactor using enriched uranium fuel rods. Cooled by a liquid metal stream which in turn gives up its heat to form steam in a steam generator.

Monsanto Chemical Co.—
Union Electric Co. of Missouri.

Two preliminary conceptual designs, both sodium-cooled, natural uranium, graphite moderated reactors.

A. A reactor using internal cooling of the fuel elements.

B. A reactor using both internal and external cooling of the fuel elements.

Detroit Edison Co.—
Dow Chemical Co.

Several conceptual designs of reactors differing markedly from reactors of known technology and designed for operation at considerably higher temperatures than the reactors of the other company groups.

Unfortunately because of the highly classified nature of the reactor technology involved in the Detroit-Dow systems less actual data can be given regarding these studies than those of the other groups, but the chances that these systems will ultimately prove feasible are excellent.

The release of these four reports should be of inestimable value to the engineering profession even though, for security reasons, specific reactor details must be withheld.

### The Commonwealth Edison-Public Service Study

As indicated above, the Commonwealth Edison—Public Service group chose the gas-cooled reactor first because there was more information available on this kind of reactor. It consists of two colinear graphite cylinders with adjoining end faces parallel but separated by a small gap. The fuel channels are parallel to the cylinder axes and are cooled by helium gas which enters the system through the gap between the cylinders. The fuel slugs are of natural uranium metal with a center hole and provided with fins which support the slugs in the channels.

The coolant, helium, was selected since it has no chemical reaction with uranium and zero neutron absorption cross section. Also, it has high specific heat but low density. Since pumping requirements for circulating the gas are directly proportional to the volume, pressurizing the helium will decrease the fan power needed. Hence, operation will be at a helium pressure of about 10 atmospheres.

The reactor requires a spherical vessel 44 ft in diameter. The total heat output will be 350 megawatts. The helium inlet temperature will be 450 F and the outlet temperature 742 F with a helium flow of 3.27 x $10^6$ lb per hr. The boilers will be simple since there will be no ash and no combustion products. The low helium temperature cannot cause overheating of the tubes even if the flow of water is interrupted. It is planned to use 10 boilers, each with a capacity of 90,600 lb per hr. Steam conditions will be 265 psia, 525 F. These 10 boilers will supply steam to a turbogenerator rated at 60,000 kw.

The heavy-water reactor of the CE-PSNI group is based on the considerable work done on this type of reactor at Argonne National Laboratory. This reactor is enclosed in a steel shell built for a pressure of 500 psia. Heavy water ($D_2O$) is used as moderator, coolant, and reflector. The fuel elements comprise a number of separate fuel elements each consisting of an assembly of uranium elements in thin metal casings. These are placed in cylindrical channels. The fuel element maximum surface temperature will be 465 F when the $D_2O$ outlet temperature is 440 F.

Steam will be generated in steam generators, built like conventional evaporators, by heat transfer from the $D_2O$ to the $H_2O$. Steam conditions will be 175 psia, 371 F. The 18 steam generators will be arranged in three banks of six each around the reactor as shown in the plan view of the station in Fig. 2. As will be noted, all the equipment in the circular plant is arranged symmetrically, with the reactor in the center. Each steam generator will produce 180,000 lb of steam per hr. This total, 3,240,000 lb of steam per hr will supply three turbogenerators of 80,000 kw each, a total of 240,000 kw. The total heat developed in the reactor will run 1065 megawatts but this can be raised if a higher velocity of $D_2O$ is used. The cost of this plant is estimated at $118,000,000 or $492 per kw.

### Pacific Gas & Electric Co.-Bechtel Corp. Study

The Pacific Coast group submitted two reactor designs, one having immediate technical feasibility, the other having more development problems but offering greater future promise.

The first design involves a light-water-cooled, heavy-water-moderated reactor. This unit consists of

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an aluminum tank with a multiplicity of aluminum tubes between tube sheets, serving as the container for the moderating $D_2O$. Fuel is placed in pressure tubes which extend through the core tank concentric to the aluminum tubes. Light water, the primary coolant flows through these pressure tubes. The reflector consists of an annulus of $H_2O$ around the tank and a 1-ft layer of $D_2O$ across the top and bottom of the tank. The primary coolant is circulated between the reactor and the steam generator by means of high capacity circulating pumps. The primary coolant pressure will be 1000 psig.

The power developed in the reactor will be 500 megawatts (heat) and the gross electric power, 106.2 megawatts. Steam conditions are 160 psig, 378 F. Steam will be supplied to a tandem-compound, double-flow, 1800 rpm turbogenerator rated at 125,000 kw. The total cost of this plant is estimated at $41,000,000, or $386 per kw.

The second study of the Pacific Coast group involves a liquid-metal-cooled *fast* reactor. This type was selected because of its ability to breed as well as its use of higher temperatures. It produces more fissionable material than it consumes. It would resemble in some respects both the Submarine Intermediate Reactor (SIR) and the Experimental Breeder Reactor (EBR) though it is based more on the latter. Future improved designs could be substituted without altering the basic arrangement of the plant. The reactor core of highly enriched material is surrounded by a breeder blanket composed of either depleted or natural uranium. More than 90 per cent of the heat production takes place in the core which consists of an assembly of a large number of stainless steel fuel elements.

The reactor (Fig 3) is contained in a cylindrical steel vessel 8 ft in diameter and 8 ft high. Heat is removed from the reactor core and blanket by liquid sodium flowing at high velocity—30 ft per sec. Circulation is maintained by two electromagnetic pumps. The primary coolant (sodium) is pumped to two intermediate heat exchangers, entering at 900 F and returning to the reactor at 600 F. Heat is transferred from the primary coolant to an intermediate coolant, also sodium. This intermediate coolant is circulated by electromagnetic pumps to the steam generators. The secondary coolant enters the steam generator at 850 F.

Steam is produced at 500 psig, 750 F in two steam generators each producing 800,000 lb per hr. These consist of a steam drum, evaporator, and superheat section. The steam is delivered to the turbine throttle at 485 psig, 750 F. Steam is delivered to a single large turbogenerator of 154,600 kw maximum capability, a tandem-compound unit operating at 1800 rpm. Although a relatively low pressure installation, this unit operates on a conventional regenerative cycle with four extractions for feed-water heating.

The total cost of this plant is estimated at $51,000,000. As a dual purpose plant this design will produce plutonium at maximum rate and at the same time power at 6 mills per kwhr. This figure is comparable to the cost of power produced in conventional fuel fired plants. Based on *power production only*, and including a 5-yr. amortization this plant would produce power at 12.5 mills per kwhr. However, after the 5-yr amortization, the power cost will be only 3.6 mills per kwhr. Considering a future improved reactor built for power only, a power cost of 5.5 mills per kwhr is obtained, slightly less than the 6 mills per kwhr figured for a conventional fuel plant.

### Monsanto Chemical Co.-Union Electric Co.

The studies of the Monsanto-Union Electric Co. group were based on the operation of the reactor for the production of military plutonium for an assumed period of 5 years.

Two designs are submitted, both sodium-cooled, graphite moderated reactors. The Hanford reactors were chosen as models. Water, however, would not permit operation at high enough temperatures so pure sodium was chosen as a coolant. Sodium has a low neutron absorption cross section and a high boiling point. The two types of reactors arrived at, have the same general arrangement but differ in the coolant system and in the method of charging. The core is in the form of a graphite prism 24 ft high and 39 ft across the face. It is provided with cooling channel holes spaced on a square lattice. Tubular fuel elements, placed in the holes by suitable loading mechanisms, are cooled by sodium flowing both through the fuel elements and the annular space between the walls of the cooling channel and the fuel elements. The fuel channels can be loaded and unloaded while the reactor is operating at full load. The studies indicate that the most economical operation plutonium-power reactor is one using enriched fuel.

Heat from the liquid sodium is transferred to water to generate steam in special heat exchangers. These are shell and tube type units with double concentric tubes to provide a barrier space between the sodium and water, the barrier space being filled with mercury.

The first Monsanto-Union Electric reactor uses only internal cooling of the fuel elements. It is based on receiving sodium from the reactor at 650 F and returning it at 300 F. The hot sodium produces turbine throttle steam at 150 psia, dry and saturated at a rate of 3 million lb per hr. This is fed to two

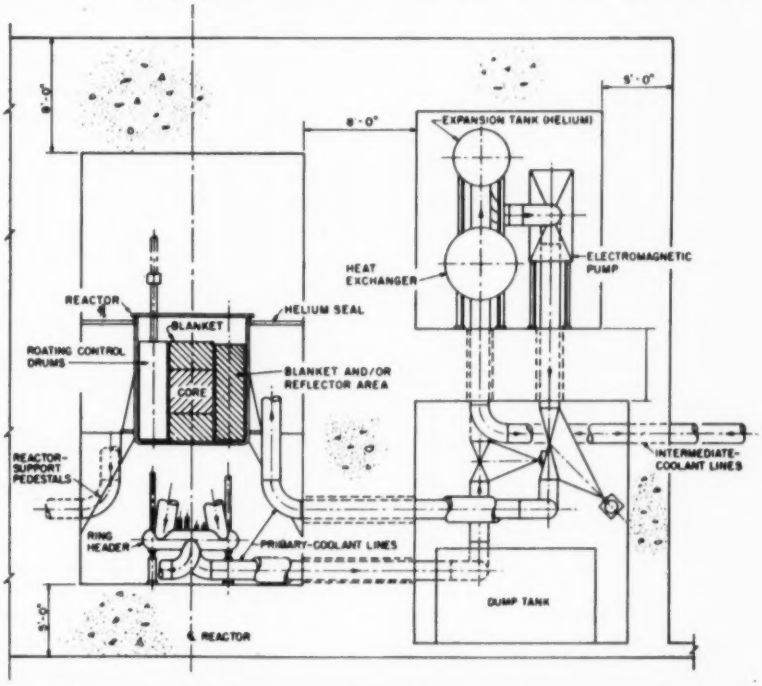


Fig. 3. An elevation of the liquid-metal-cooled reactor plant of the Pacific Gas & Electric Co.-Bechtel Corp. group

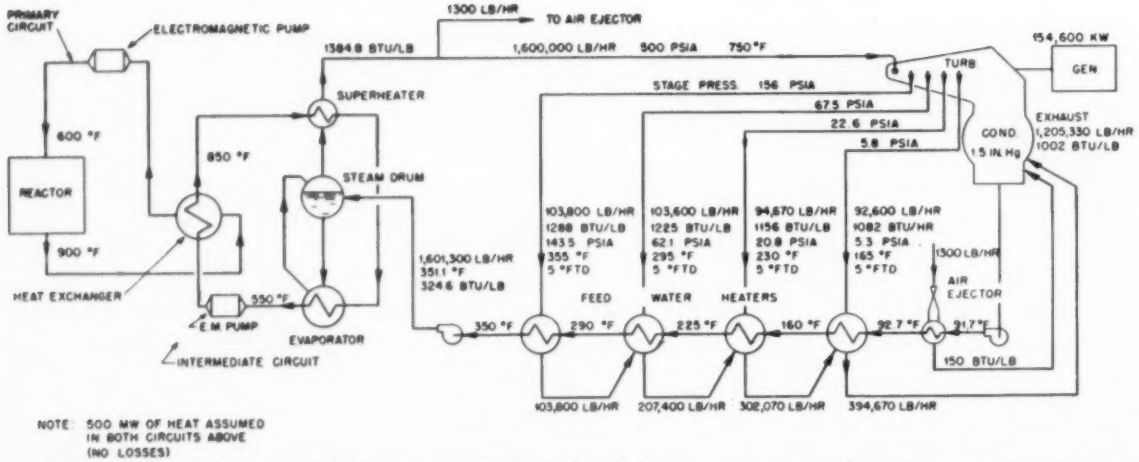


**Fig. 4. Heat balance of the sodium-cooled fast reactor of the PG & E - Bechtel group. FTD means final temperature difference. Gross power, 154,600 kw; net power, 145,300. Net station heat rate, 11,760 Btu per kw-hr.**

110,000 kw turbogenerators. These generating units are far removed from contemporary design practice. They will be very large, physically, requiring four 18-inch steam inlets and will have live steam reheat between stages. The rate of flow to such a large low pressure turbine would tend to make load control by means of steam throttling impractical. Since the production of plutonium is the prime criterion of operation, its production rate should be maintained *regardless of electric demands or turbine availability.* Thus, a separate dump steam condenser would be provided with a capacity equal to the entire heat output of the reactor.

For the second design this group uses a reactor with both internal and external cooling of the fuel elements. They have also developed two power cycles. One of these utilizes the heat output of the sodium coolant over the entire temperature range between the reactor inlet and outlet temperature, 300 to 900 F.

The second cycle rejects the heat of the coolant below 500 F directly into the heat sink. The main advantage of the second cycle is that it substantially reduces the investment and gives a power output of more readily marketable size. The steam conditions for both power cycles are 400 psia, 746 F. In the first cycle steam would be generated at 8.8 million lb per hr, fed to a turbine cycle with a gross thermal efficiency of 28 per cent. It would produce 878,000 kw from 5 turbogenerators.

In the second cycle steam would be generated at 4.8 million lb per hr and produce 579,000 kw in three turbogenerator units. The net output would be 554,000 kw.

These studies are based on a reactor producing plutonium for a period of 5 years. In the first case (internal cooling) power would be produced at 4.13 mills per kwhr, whereas in the second case (internal and external cooling) the power cost would be 3.73 mills per kwhr. This compares with 3.97 for a modern fuel-fired plant.

## Dow Chemical-Detroit Edison Studies

Of the four sets of studies, those made by the Dow Chemical Co-Detroit Edison group are, perhaps, the least specific, yet are the most startling in their implications. Unfortunately, the reactor technology involved is so unique that no details of even the proposed systems can be disclosed.

These studies led to the selection of a liquid-metal-cooled *fast* breeder reactor. This type would provide the high coolant temperature necessary for efficient power production. Originally studies were made of reactors of known technology. It was assumed that a reactor for most immediate construction would have to be a thermal neutron reactor for the conversion of U-238 to plutonium. Power can be recovered from such reactors but it would be at a sacrifice of plutonium production because the power level, and hence the rate of Pu production is determined by the rate of heat removal. For a stationary fuel element operating at a given temperature, the amount of heat which can be removed is, of course, increased as the average coolant temperature is decreased. On the other hand, production of power requires a relatively high-temperature coolant. Thus the production of power and weapons material will be compatible only when the coolant exit temperature is high enough to permit efficient power recovery at, or near, optimum materials-production conditions.

The desirability of a reduction in the chemical-processing and fuel costs indicated the need for a fluid fuel and a much closer integration of the reactor and the separations and decontamination processes. As a consequence, this group concluded that the chances are excellent that molten metal processes can be developed into a superior separations method. If so, it should be more compatible with present reactors and a great deal less expensive than any aqueous processes, particularly if machining and jacketing of fuel slugs can be avoided. If it should be found necessary to use solid fuel, then fuel elements must be of such form or shape that they may be fabricated simply enough to be made by remote control.

A number of mechanical design types are conceivable which might meet all or part of the desired requirements. For example: 1. A jet-mixed centrifugally separated liquid-cooled reactor with liquid fuel and continuous reprocessing. 2. A reactor having liquid fuel contained in a *reactor pot* with the coolant in tubes. 3. Coolant outside fuel tubes and with a liquid or mobile fuel inside tubes, with or without the fast, continuous reprocessing.

The theoretical reactor that would incorporate all the most desirable ultimate objectives is a fast breeder with a true fluid fuel. It would include metallurgical processing and *would not have conventional heat transfer surfaces.* It might be built of refractory materials that would be good for either thermal or high-energy neutrons. The core of the reactor would be *all molten metal.*

The advantage of these fluid-fuel reactors proposed in this study lies in the fact that they are capable of operating at much higher temperatures than conventional types, and in at least one of the five types outlined in this study, the maximum coolant temperature for steam generation is 1020 F.

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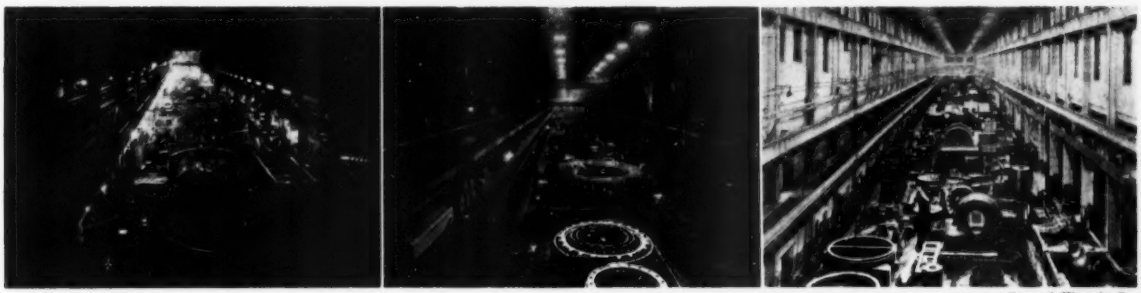
# 6....

# Significant Factors in ILLUMINATION DESIGN

By LEONARD V. JAMES, Illuminating Engineering Consultant



General Electric Co.

Fig. 1. The picture at the left shows an Allis-Chalmers erection shop before lighting changes were made. The center picture was taken after new lighting was installed. Picture at the right shows the result after the shop was painted

PLANT ENGINEERS and others, who are charged with the responsibility for planning a lighting installation, will be successful if they keep in mind the real objectives. As developed in the first article in this series in PLANT ENGINEERING,* the function of light is to aid in seeing. This is true whether the light is from natural or artificial sources. And the principal purpose of the installation of windows and fixtures is to provide the most desirable lighting aid to seeing that is economically and structurally practical.

### Fit Lighting to Seeing Need

So the first responsibility of one who would design a lighting installation is to analyze the seeing need. This may be purely decorative, from monumental fixtures to beautiful windows. Only enough light would be required so people could move around safely while they subject themselves to and enjoy the environment. Such conditions are rare —an example might be a ballroom which is never used for other purposes than for such social activities as dancing. It may seem to be a far cry from a ballroom to a machine shop. However, the reference is made to point out that the objective is to fit the lighting into those activities in the room which depend on seeing.

For the purpose of this article, it is going to be assumed that preliminary studies of seeing requirements have been made and the installation is about to be planned to meet them. The next step is to select the type of general lighting fixture.

The writer has often wondered, during his years of experience in lighting, why the workman in the shop is not entitled to as good lighting in quantity and quality as is the worker in the office.

The only answer to such a question has seemed to be one of maintenance—keeping the fixtures clean. This has not been truly realistic. Provision can readily be made whereby cleaning the fixtures can be performed as easily in the workroom as in the office. Where needed, dust-tight covers on the fixtures add but little to the capital outlay and increase the total cost of light very slightly. Such covers may even reduce the unit cost through maintenance of the desired levels with fewer fixtures and less wattage.

In some sections of the country, maintenance companies are available which contract to keep the lighting installation clean and in good operating condition for those who wish this service. Some of these contractors even provide the lighting installation desired by the operator, renting it to him on a maintained basis. Some of these economic ideas will be considered further in a later article.

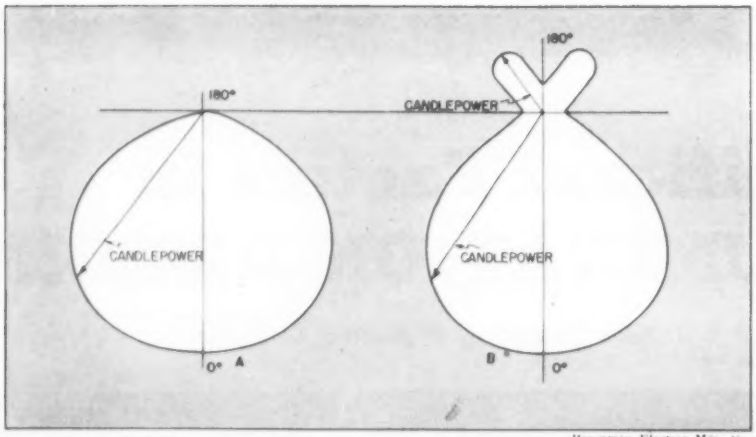
Perhaps another reason for the difference in attitude between shop and office lighting has been that fixtures for the former have been utilitarian, for the latter decorative. In fact, open bottom, closed top reflectors have nearly always been used in shop areas, ever since it was first discovered that these would provide more light at the work plane than would the bare bulbs. "It has always been done that way" has been the answer. This hardly is a good answer to the present demand for sharpening the tool of vision and conserving the time, energy and health of highly paid employees.

The significance of these ideas—importance of quality seeing conditions, well maintained, in shop operations—is being recognized today. One evidence of this is the new types of general lighting fixtures being offered by nearly all fixture manufacturers.

These new industrial fixtures are superior in two ways. First, care is taken to provide good brightness control by shielding between the lamps and by lamp selection. Second, the reflectors are open at the top so they can deliver an important part of the light from the lamps to the ceiling and upper walls. See Fig. 2. The ceiling and wall surfaces should be painted in light colors and well maintained. These factors will result in visual comfort as well as seeing effectiveness. The reflected light from these areas also serves to soften objectionable shadows at the work. The effectiveness of this is indicated in the group of pictures in Fig. 1.

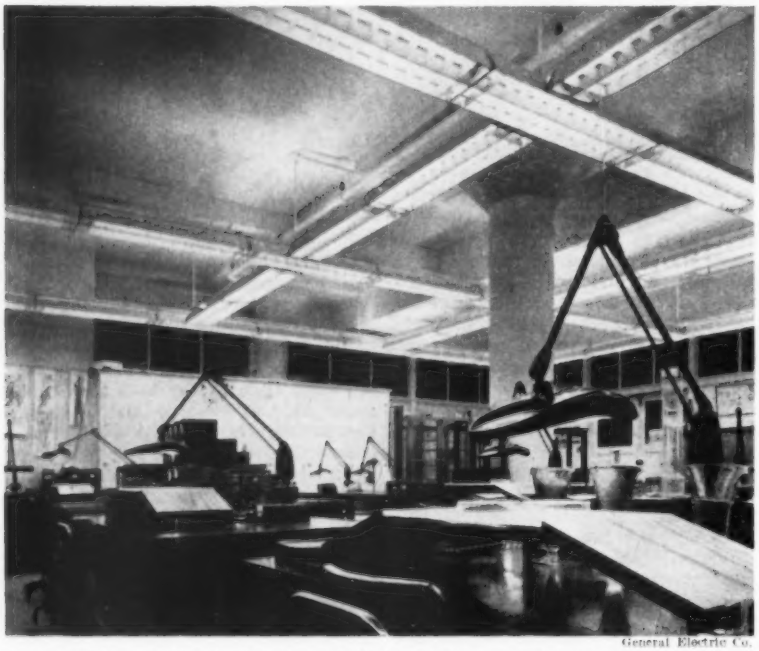
Some managers will of course stick to the old methods, will object to what they may consider "soft treatment" of the workmen. Many, on the other hand, will analyze the

* The first article in this series, "Lighting for Seeing in Industry," appeared in the January, 1953 issue, page 73.




Benjamin Electric Mfg. Co.

**Fig. 2. Curve A shows candlepower distribution curve for the old closed top industrial reflector. Curve B shows curve for reflector with an indirect component**



General Electric Co.

**Fig. 3. This seed inspection room is lighted to an average of 80 ft-c, without shadows, by grid arrangement of reflectors spaced on 9 ft centers. Supplementary units provide over 200 ft-c of additional illumination at point of inspection**

matter from a truly economic standpoint. They will hope to help the employee to do his work more rapidly and accurately, and incidentally more comfortably, throughout each day and each succeeding day.

These will find the difference in the cost of the new lighting, as compared with the old, in per cent of that of the total operation, to be a small amount to pay for a relatively larger return which can normally be expected.

As increases in general lighting levels in plants have been accepted, some managers have been disappointed in that workmen have often insisted also on having additional local or supplementary lighting.

It is true that improved general lighting provides adequately for many operations, for which supplementary equipment was formerly required. It is also true, however, that for many tasks calling for precise seeing of fine detail, upwards of 100 ft-c had previously been provided under the old system by the local reflectors. Of course, the environment was poor. The seeing effort caused undue fatigue and strain because of this. The workmen took more time away from concentrated application to relax and relieve the condition. But the fact remains that they often still could see the work more distinctly than with the really lower levels of better general lighting in use today.

So it is that improved modern standards for plant lighting in 1953 call for good general lighting of from 20 to 75 ft-c (10 ft-c in some cases for very rough work with no seeing difficulties, 100 ft-c in others where all of the work is fine and seeing is particular). Frequently superimposed local supplementary lighting should be provided for an additional level at the point of work, in some cases as much as 1000 ft-c.

## Direction of Light

With all of this planning there should be combined a treatment of room surfaces which will establish a proper visual environment, in which brightness ratios at the fixtures, on the work and about the room are limited and therefore are comfortable. See Fig. 3.

In planning to use supplementary lighting for particular operations, it should be borne in mind that the direction of the light may be even more important than the amount delivered. The relative positioning of the workman, the task and the fixture is important. This must always be such that the light gets to the parts where it is needed, without shadow from other parts of the task nor from the operator or other extraneous objects. The light also must not interfere with seeing by being directed into the operator's eyes either directly or by reflection.

Other nearby operators must, incidentally, be considered in this connection. It is obviously a management failure if the facilities provided by the company to assist in production fail to accomplish all it is possible for them to do because of faulty selection or arrangement.

It is not within the province of a brief article to go far into the detailed application of these principles of lighting to various kinds of plants and operations. The reader is instead referred to the American Standard Practice for Industrial Lighting, approved August 22, 1952, by the American Standards Association as their standard A11.1-1952.†

Before this standard was adopted, it was approved by a sectional committee made up of representatives of twenty interested societies and groups. Among these were technical societies, surety companies, plant operators and labor.

## Significance of Spacing

Some general details of design, however, will be considered. Much of the illumination from a general lighting installation comes to the work directly from the fixtures. It is therefore imperative that the fixtures should not be spaced so far apart that "hills and valleys" of light will result. Everything considered, a spacing of 1.5 times the

†This booklet is available from the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y. The price is 50 cents.

mounting height above the working plane is likely to be a safe maximum. A ratio of 1 to 1 is usually better and very little if any more expensive in the long run. This applies to individual reflectors and also between rows of fluorescent fixtures. The effect of the closer spacing is illustrated in Fig. 4.

It has been stated that, particularly in a large room, all of the light emitted below the horizontal ultimately reaches the working plane. This would be true if obstacles do not intervene. It should, however, be borne in mind that it is usually desirable that these obstacles and other vertical or near-vertical surfaces also be lighted.

To accomplish this, the best distribution of light from a fixture for shop use might be described as a broad concentration downward, with enough of an upward component to illuminate the ceiling and part of the upper walls. Any other space on the walls will be illuminated by reflected light, to create the desirable brightness environment. See Figures 1 and 3. Refer again to Fig. 2 for a typical candlepower distribution curve for manufacturing areas.

For office and fine laboratory lighting, the decorative fixtures employed may deliver more light in a horizontal direction through translucent sides or by reflection and these will usually have a larger upward component. See Fig. 5. In fact, this upward light may often be a large part of the total, in which case greater dependence is placed on a high ceiling reflectance, well maintained. De luxe installations in which the light is admitted through a translucent ceilings are available.

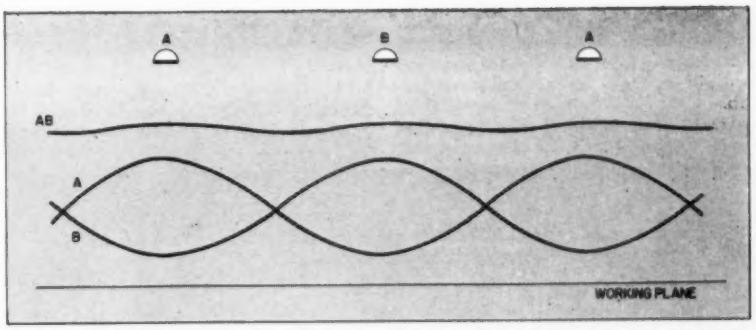



**Fig. 4. In this sketch, the row of reflectors at A are first considered alone and the footcandle levels delivered are indicated by the A curve. Note the spacing is about double the mounting height above the working plane. Introducing additional rows B, which deliver levels indicated by the B curve, fills in the valleys. Practically uniform lighting results, plus better illumination of vertical surfaces**

Solar Light Mfg. Co.

**Fig. 5. Over 40 ft-c of light are provided from the 60-in. fixtures, with some upward light to illuminate the ceiling and to relieve contrast. Low brightness fluorescent lamps are employed. Louvers are omitted which greatly facilitates cleaning. Reflections from desks, papers and machines are also minimized**

## Quality vs. Quantity

A well maintained, reasonably light color on ceilings and walls is always desirable for comfort and for efficiency. Dark colored ceilings and walls accentuate brightness differences in the visual field and contribute to discomfort. In this connection, it should be remembered that surfaces, to appear light, must have light energy delivered to them, as well as be light in color. White is black in the dark. As for efficiency, dark ceilings and walls will reflect as small a part of the light delivered to them as would correspondingly dark fixture reflecting surfaces.

There is a tendency today, on the part of some managers and even of some engineering consultants, to "go overboard" in favor of quality in lighting, irrespective of quantity. The writer defers to no one in his appreciation of the importance of good brightness balance in any operation, especially in the office or plant.

But if comfort in lighting were all that is necessary, night-time work would most certainly be taken out-of-doors into the moonlight, a most comfortable as well as romantic seeing environment. It is true that a somewhat lower level of illumination may be possible, for equal seeing effectiveness, under completely comfortable conditions. However, this comfort is usually a value that is superimposed on adequate footcandles to help the operator secure a maximum of benefit from such levels as he needs.

Only where nearly identical lighting equipment has previously been installed in a correspondingly identical interior, can a watts per square foot basis be used satisfactorily in design. This is shown in Table I for the room shown in Fig. 6.

It is here assumed that the 60 ft by 60 ft room, without partitions, has been lighted with 32 groups of two-lamp fluorescent fixtures, three fixtures to a group, arranged as indicated. The ceiling is 20 ft high. Partitions have been installed to provide a 30 ft by 30 ft room and one 15 ft by 15 ft, without disturbing the lighting. The original near-white decoration of the ceiling provides 75 per cent reflectance and the medium light walls 50 per cent, while the new partition walls have the same finish. The resulting levels of illumination are shown in the upper part of the table. A indicates that typical industrial fixtures are in use; B, typical direct-indirect office type fixtures, and C, typical indirect office type fixtures. The same computations have been made for a medium light ceiling (50 per cent) and medium dark walls (30 per cent) which are also recorded.

All of these computations are next

repeated for an 11 ft ceiling, with the same room sizes and ceiling and wall colors and the results are recorded in the lower part of the table.

Only a few of the interesting relations between the results in this investigation will be noted here. It should be remembered that the watts per square foot have not been changed at all.

Importance of Room Size: Even in the well decorated room (75/50) with the 20 ft ceiling and direct lighting fixtures (A), the level of illumination in footcandles is reduced over 40 per cent by reducing the room size from 60 by 60 ft to 15 by 15 ft. The only change has been an increase in the area of room surfaces to absorb the light, surfaces some managers consider unimportant where direct lighting is used. True, the loss in the case of indirect lighting is more marked.

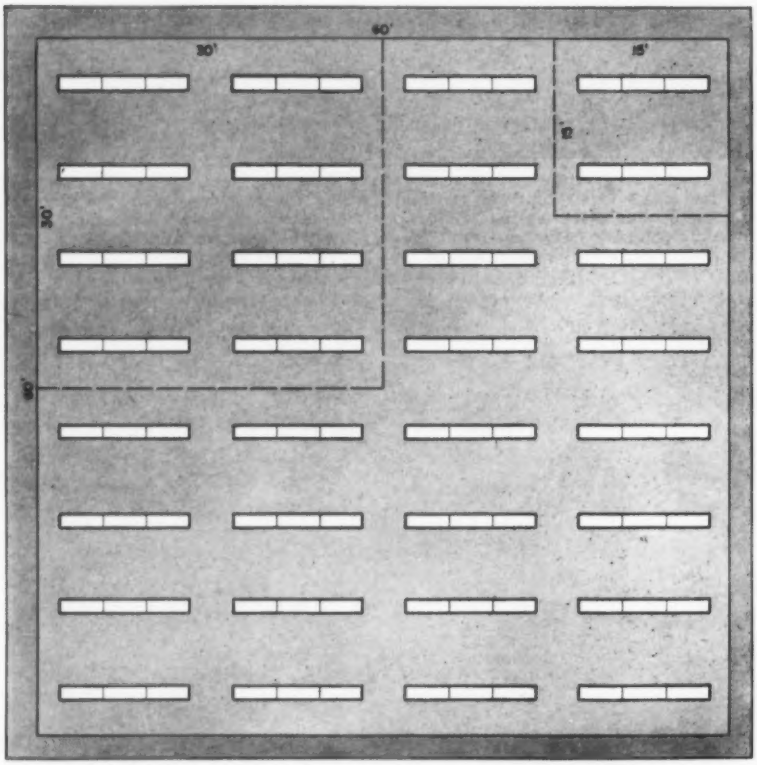



**Fig. 6. A floor plan for Table I shows 32 groups of three fluorescent fixtures each. These are permanently installed in the 60 ft by 60 ft space. Partitions are installed later, decoration of ceiling and walls changed and ceiling height altered, as desired. Footcandles, computed for all conditions, are recorded in Table I**

**Table I. Footcandle values of three fixtures for various room conditions in Fig. 6**

**Rooms with 20-foot Ceilings**

| Area (in feet) | 60 by 60 | | 30 by 30 | | 15 by 15 | |
|---|---|---|---|---|---|---|
| Ceiling Reflection / Wall Reflection | 75/ /50 | 50/ /30 | 75/ /50 | 50/ /30 | 75/ /50 | 50/ /30 |
| Fixture* | | | | | | |
| A | 53 | 49 | 42 | 39 | 30 | 25 |
| B | 36 | 30 | 27 | 21 | 20 | 15 |
| C | 29 | 17 | 21 | 12 | 15 | 8 |

**Rooms with 11-foot Ceilings**

| Area (in feet) | 60 by 60 | | 30 by 30 | | 15 by 15 | |
|---|---|---|---|---|---|---|
| Ceiling Reflection / Wall Reflection | 75/ /50 | 50/ /30 | 75/ /50 | 50/ /30 | 75/ /50 | 50/ /30 |
| Fixture* | | | | | | |
| A | 66 | 60 | 57 | 54 | 42 | 39 |
| B | 46 | 37 | 39 | 32 | 27 | 21 |
| C | 34 | 21 | 27 | 16 | 20 | 11 |

*A is for a typical industrial type fixture; B is for a typical direct-indirect office type fixture; and C is for a typical totally indirect office type fixture

Importance of Ceiling Height: Lowering the ceiling from 20 ft to 11 ft causes an increase in the delivered illumination level. This is not, however, as might be supposed, because the lamps are closer to the work—the installation distributes the light so well over the room that the "inverse-square law" does not apply. It is because the absorption of the light is less by the walls of the lower ceiling room.

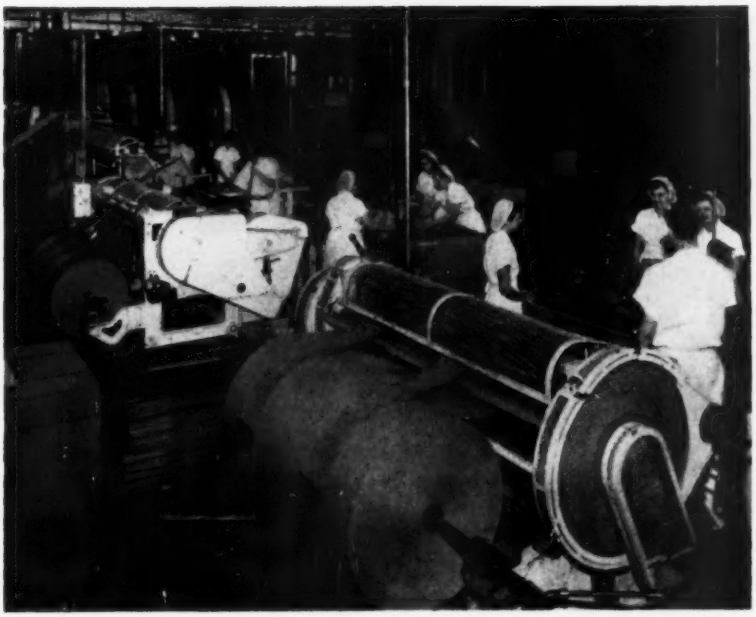
Significance of Room Proportions: The most significant thing about room dimensions is their proportions. Note that nearly identical results are obtained in a 60 by 60 ft room with a 20 ft ceiling as in a 30 by 30 ft room with an 11 ft ceiling, for any fixture type and decoration. The same relation holds in comparing the 30 by 30 ft room and 20 ft ceiling and the 15 by 15 ft and 11 ft ceiling.

## Maintenance Factor

Significance of Maintenance Factor: All of the above values were computed on the basis of a 70 per cent maintenance factor—30 per cent average decrease from original footcandles in service. This is hardly fair to the differing fixture types. The decrease for any given schedule of cleaning is due to several factors.

First is the decrease in the light emitted by the lamps as they age. This, however, would be the same for all of the fixtures in this case. Second is the decrease due to the accumulation of soil on the fixture reflecting and transmitting surfaces, which will depend in part on the position and material of these surfaces and on the air flow over them. Third is a depreciation in the reflectance of the ceiling and walls. The significance of this room depreciation is indicated by the differences between 75/50 and 50/30 rooms, other conditions being the same. This matter of maintenance factor will be discussed further in a later article.

The purpose in writing this article has been more to explain some of the important things that must be considered in the design of lighting than to outline the design procedure itself. The detailed method of predetermining illumination results from any planned installation, or of planning the installation for desired results, is available in IES and in manufacturers' publications.



**Employees are furnished with white clothing without any obligation for garments or laundry. The surrounding area of the plant is made more pleasant by painting ceilings, walls, floors and machinery light colors. Note how machinery is guarded**

# Seven Steps to Safety and Good Plant Housekeeping

**By J. A. LONG, Superintendent, Bay West Paper Co.**

NO MATTER what steps are taken in the plant to promote good housekeeping, keep machinery well guarded and encourage safe working habits, safety is still a personal matter. Being a personal matter, the best that management can do is to create an atmosphere in which a group of individual employees will take pride in doing their work safely as they take pride in doing it well.

The important steps toward development of such an atmosphere at Bay West Paper Co., based on the experience of 22 years of effort, were: 1. Provide a clean plant; 2. Paint ceilings, walls, floors and machinery; 3. Provide clean work clothing for employees; 4. Provide a health and hospitalization program; 5. Cooperate with the insurance company and the state industrial commission; 6. Stimulate safety contests to maintain interest; and 7. Keep looking for new ideas.

By adhering to these steps as much as is humanly possible, the company has attained safety results which are rather unusual. Since the summer of 1937, there have been only three lost time accidents among the 55 production employees. Between that time and the summer of 1950, 13 full years of operation were completed without a lost time injury to any employee. The break in this 13 year record occurred when an employee severely lacerated a finger in a band saw he had operated safely some 11,000,000 times during 20 years.

## The Seven Steps

**Step 1**—About 22 years ago, the company decided that the conditions in the mill were not suitable for the manufacture of a sanitary product. To correct this, a general cleanup program was instituted, resulting in a live, effective safety program as a by-product.

The mill was cleaned from cellar to attic. An enormous accumulation of old materials, machinery, parts, boxes and miscellaneous items were discarded. A proper storage place was found for all odds and ends that could not be discarded.

**Step 2**—Then, the machine rooms and ceilings were painted white and the floors gray. All converting machines were painted with white enamel and the operating parts a pastel green.

**Step 3**—The employees were furnished with white clothing without any obligation for the garments or for laundering them.

The entire plant took on a new aspect. Good housekeeping was easy because with everything clean and in its place, all disorder or misplaced materials showed up like cats' eyes in the dark.

**Step 4**—While this was going on, pre-employment physical examinations were made compulsory with rechecks every six months. Benefits gained by this practice were the improved working ability of the employees, better relationship between workers and management, proper placement of employees and increased production. For years, the company paid employees full wages for time lost for medical care. Now, of course, important hospitalization and health insurance have taken over this part of the company's responsibility.

## Aid from Insurance Firm

**Step 5**—Representatives of Employers Mutuals of Wausau have worked closely with the company in stimulating the interest of employees, watching safety pitfalls that might be overlooked, and contributing up-to-the-minute ideas that have worked in other plants. Any company can profit by listening to the advice of its insurance representative and industrial commission safety people.

**Step 6**—Additional employee interest in safety is stimulated by a safety drawing which is held in the plant every month. If there is no lost time accident for a 30-day period, there is a drawing among the employees for a purely nominal 50 cents. A second accident-free month raises this price to $1.00. The prize then increases $1.00 a month for consecutive accident-free months until it reaches $10.00. There it remains and is drawn every month at $10.00 until the next lost time accident puts it back to 50 cents again. After a full year without a lost time accident, the company gives a banquet for all plant personnel.

Safe practices have always been company policy. No machine is allowed to operate unless it is properly guarded, regardless of production demands. Any new machines purchased must be guarded by the manufacturer under the supervision of the State Industrial Commission, or it will not be accepted.

Approximately one-fourth of the production employees are members of an Employees Safety Committee. They make their own rules. Although there has never been a lost time accident from foot injuries, the committee voted to make wearing safety shoes a requirement of employment. The company pays half the cost of these shoes. Safety glasses must be worn by all employees who wear eyeglasses. The company pays for these prescription glasses. All women workers are supplied with safety caps and their fellow employees see to it that they wear them.

# FLUID POWER SYSTEMS
## Power Lines, Hydraulic Cylinders

The efficient operation of fluid power systems depends on the proper arrangement of fluid power lines . . . Article enumerates factors which should be considered . . . Various types of cylinders, gaskets and seals are mentioned

By H. L. STEWART, Special Engineering, Logansport Machine Co., Inc.

TOO OFTEN, the importance of the fluid power lines is forgotten when laying out a system, so that failure or inefficiency of the system results. There are several factors to consider when laying out or installing the lines of a fluid power system.

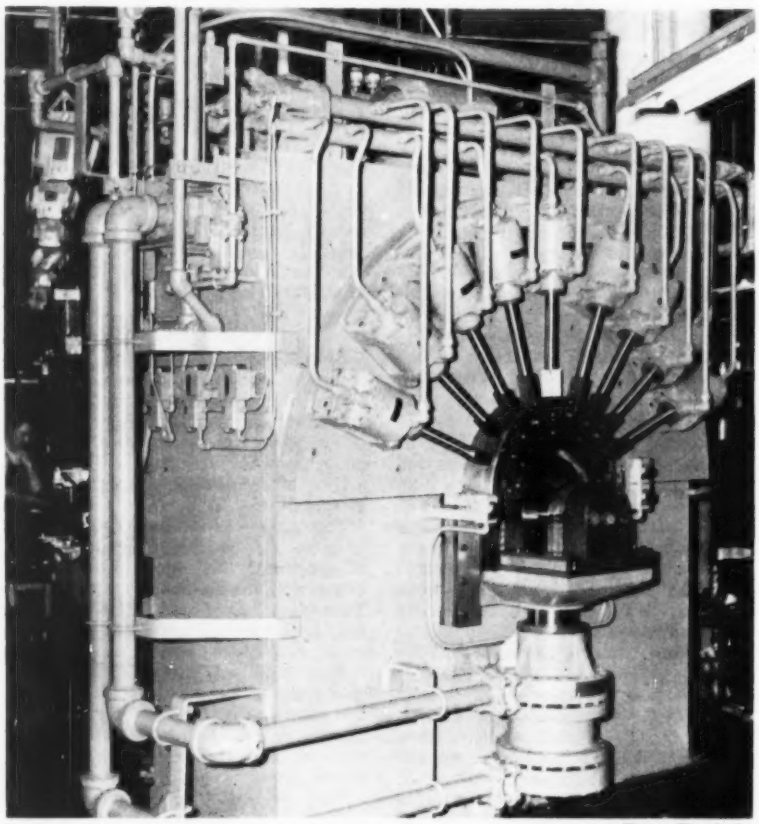
1. The lines must be of sufficient cross sectional area to carry the fluid with a minimum of friction and resistance. While the maximum oil flow should not exceed 15 fps, lower velocities are more desirable. Friction is a cause of heat and loss of efficiency. Extra large exhaust lines are especially important if the circuit is to function properly. Often malfunction of reducing valves, sequence valves, and other hydraulic controls can be laid to exhaust lines of insufficient diameter. When one line is carrying the exhaust oil from several valves, any back pressure created is bound to cause trouble. Restrictions from fittings must also be eliminated.

2. The lines must be as short, with as few bends as possible. Short lines speed up the response between valves and cylinders and eliminate lag in the system. Long lengths of piping not only increase the amount of friction but are costly, especially if they are of large diameter.

The radius of pipe or tube bends in a hydraulic system should be about three pipe diameters for best efficiency. When using a bend of less than three diameters, the pressure drop is caused by the sudden change in the direction of the fluid. If the bend is greater than three diameters, the increase in pressure drop is caused by turbulances being set up in the pipe. The oil must travel a longer distance before the direction is changed. It is suggested that elbows, street-ells and sharp bends of any kind be eliminated whenever possible in order to increase the efficiency of the system. Seamless steel tubing is ideal for hydraulic systems inasmuch as the majority of bends can be made which will give the highest possible piping efficiency.

3. Pressure lines should be securely fastened with steel straps. Due to the sudden change in the direction of oil when going around a bend in a section of pressure line, and the sudden stoppage of oil when a valve is shifted, the oil tries to straighten the tube and causes considerable whip if the line is not securely fastened. This sudden vibration can snap a heavy steel strap if not properly supported. Straps should be placed close together wherever vibration is likely to occur. Due to the vibration in many hydraulic systems, copper tubing is not recommended for this job because it hardens and breaks.

4. Piping and fittings of proper strength are a must. A break in a hydraulic line may or may not cause any particular damage other than to give the operator an oil bath, but it always leaves a cleaning problem and loss of expensive fluid. It is surprising to see the conglomeration of piping used in some hydraulic systems. Some even try to use common water pipe on 1500 lb systems. How some of the elbows, tees, and unions ever stand up is a miracle. The author has seen systems where there would be galvanized pipe,



Wagner Electric Co.

**Fig. 1. Piping layout shows the use of both tubing and piping in one system. Note smooth, even bends and large manifold lines; also how large piping is anchored**

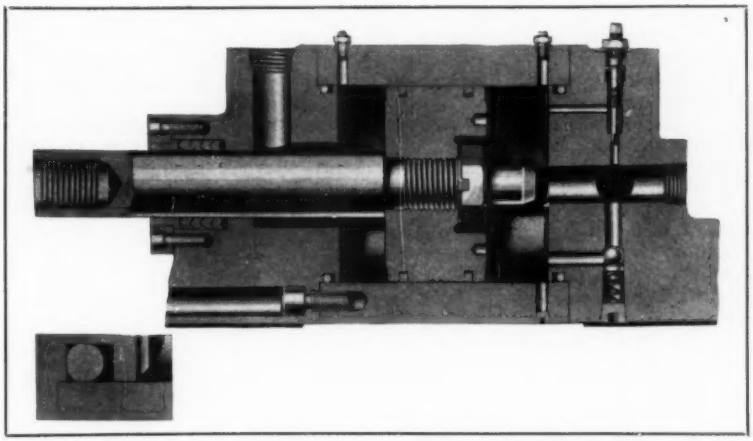


**Fig. 2. Section of a non-rotating hydraulic cylinder. Note the application of the "O" ring as static seal. It has eliminated leaky gaskets in high pressure cylinders**

heavy duty pipe, copper tubing, and steel tubing all in the same system. The fittings were whatever could be secured from a plumbing store.

5. The lines must be free of dirt, scale, and leaks. Leaks cut down the efficiency of the entire system. A good pipe compound properly applied will reduce leaks to a minimum. Often leaks around pipe threads are caused because the installer did not properly tighten the pipe in the valve, cylinder or fitting. On high pressure systems the pipe must really be pulled up tight. One of the biggest complaints against hydraulic systems is leaks, but leaks reflect poor installation or poor maintenance.

## Damage by Dirt

Dirt and scale in fluid lines will cause considerable damage to any hydraulic system. A customer will spend hundreds, yes, even thousands of dollars for precision pumps, valves and cylinders, then use some old pipe that has been lying around the maintenance department for years to pipe the system. This can ruin the entire system.

When using new pipe it is likely that pipe scale will be present if the pipe is not properly cleaned for fluid power use. The author remembers one large installation where considerable difficulty with cylinder and valve failures was experienced. The installation was checked to see if new piping was used. It was found that new piping had been used but it had not been properly cleaned on the inside and at one point in the system were found several handfuls of scale and dirt. The pipe should have been pickled and spellerized.

Often installers do not properly clean the ends of pipe after threading. Pipe shavings that fall inside of the pipe will cut the walls of the hydraulic cylinder and the bodies of the valves.

Remember the fluid lines are a vital link in the fluid power system and they should be so treated.

The hydraulic cylinder takes the fluid power from the fluid power lines and converts it into linear force, the extent of which is dependent upon the cross section area of the cylinder and the power in the line. Hydraulic cylinders may be listed under two categories, the rotating type and the non-rotating type.

The rotating type has limited possibilities for use on applications which require a hydraulic cylinder with a stationary distributor housing and a rotating distributor shaft. These are found on lathes, grinders, and winding machines. These cylinders usually operate some type of clamping device, i.e., a chuck or a mandrel.

The biggest problem in the design of rotating cylinders is packing the rotating distributor shaft. It is especially difficult to pack large diameter distributor shafts operating at high speeds and at high pressures. Packings often heat very quickly even though they are surrounded by oil from the system.

The non-rotating type cylinders have unlimited applications in all types of industry. In order to obtain satisfactory service from a hydraulic cylinder the correct selection must be made. Although the majority of applications can be met with standard cylinders listed in manufacturers' catalogs, there are numerous applications requiring special cylinders to meet a specific requirement. Operating conditions and pressures, of course, have much to do with the proper selection.

There has been vast improvement in hydraulic cylinder design over the decade. This has been brought about principally by the introduction of the "O" ring, the use of centrifugal cast iron, cast steel, and cast bronze, improvement in packings, and a better honing technique.

There are two types of "O" rings, the "O" ring gasket and the "O" ring packing. "O" gaskets are always used as static seals while the "O" ring packing may be used as a static seal or as a sliding seal. With the introduction of the "O" ring leaky gaskets especially in high pressure cylinders have been eliminated.

Figure 2 shows the application of the "O" ring as a static seal. With this construction it is only necessary to pull up the cover screws finger tight. This prevents high stresses from being set up in the cylinder cover, cover screws and tube which were usually prevalent when flat type gaskets were used. As a static seal the life of "O" rings is extremely long.

They may be used over a wide temperature range. The "O" rings of a 70 durometer hardness will withstand temperatures from –40 F to 250 F. The operating pressures against these rings may be several thousand pounds. In the industrial field "O" rings, as reciprocating seals in hydraulic cylinders, are still not too popular but have been used successfully for many applications. On pressures from 1500 psi to 3000 psi, the "O" ring should be used in conjunction with two back-up washers, one on either side of the ring to eliminate extrusion. In using the "O" ring as a reciprocating seal, either on the piston or on the piston rod, only one "O" ring should be used. If more than one "O" ring is used a pressure lock will be caused between the rings which will cause considerable friction and short packing life. When using the "O" ring as a sliding seal the surface over which it moves must have a good finish of from 5 to 15 micro-inches.

## Centrifugal Cast Tubes

Centrifugal cast cylinder tubes of iron, steel or bronze have been a big help in cylinder design and performance. In the first place these materials will hone to a mirror-like finish. Their structure is homogeneous and usually free from any porosity.

Secondly, the heavy tube construction will not become egg-shaped after it is machined. When finishing and honing thin-walled tubing it may be perfectly round when on the machine but as soon as it is removed from the machine it will become egg-shaped. When assembled into a cylinder it will allow the oil to leak past the piston.

In the third place, the heavy-walled cylinder tube helps in streamlining the cylinder. It eliminates tie rods since screws can be threaded directly into the cylinder walls. Centrifugal cast tubes have also allowed the cylinder manufacturers to carry bigger range of sizes. With the demand for larger bores and strokes for cylinders in small quantities on the increase it was more economical to select this type of

material. Cylinders up to 30 in. bores and strokes up to 15 and 20 ft are not uncommon today and in the future we can expect much larger cylinders. It does create quite a material problem.

There are numerous types of packing used today in cylinder design both for the piston and for the piston rod. The packing depends upon the application and conditions. Although it is common practice among all of the recognized hydraulic cylinder manufacturers to use automotive type piston rings in their standard hydraulic cylinders, an application demanding that the piston must seal without leakage would require some other type of piston seal. An "O" ring inserted in a groove between the automotive type rings often meets such a sealing requirement.

### Types of Seals

Some of the more common types of piston seals are: the chevron or vee-ring type, both in a continuous and split ring and of synthetic rubber or leather material; the U-cup, either of synthetic rubber or leather, the cup packing, of fabricated material, synthetic rubber, or leather material; metal rings; and "O" rings.

The conditions which determine what packing should be used are: temperature, pressure, type of fluid, speed of piston, space and metal finishes.

Rod seals include those listed above under piston seals except for the metal rings and cup packing. In addition there is the flange or "hat" packing which is made of leather or synthetic rubber. High temperature rod packings are often required when cylinders are installed around furnaces, rolling mill equipment or in other extremely hot places. These packings are of a fabricated material which will withstand heat up to 500 F.

Rod wipers and scrapers have become useful as a means to help prolong the life of the rod packing. Foreign matter collected on the piston rod when it is in the extended position should be removed by a scraper or wiper before it can come in contact with the rod packing. Rod boots of canvas or synthetic rubber material are used to advantage as a protector in a location where abrasives or fumes are a problem.

An issue which always raises a lot of controversey is whether or not a hydraulic piston rod should be hardened. One faction argues that all hydraulic piston rods should be hardened while another faction argues that rods should only be hardened in cases where the application is such that there is an excessive amount of dirt and abrasives present which may cause scoring of the rod.

If rods are to be hardened someone must pay for it and that someone will be the customer. On large rods the hardening process may become complicated and expensive.

Before hardened rods were thought of, precision cylinders were built and many are still in active operation after 15 to 20 years without excessive wear in the rods. Of course with higher speeds and with cylinders being used in many unusual applications, the introduction of hardened rods have helped reduce packing leaks due to scored rods. The author is in agreement with the second faction inasmuch as he does not feel that it is advisable to go to the expense of hardened rods if the application does not warrant it. Even the hardest rods can become worn if certain abrasives are present.

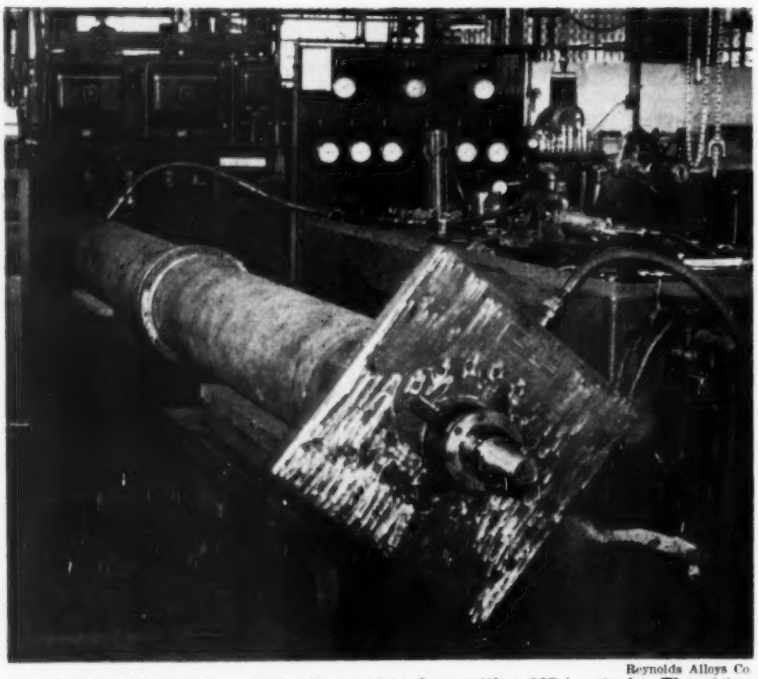
The cushioning feature is very important in an hydraulic cylinder traveling at high speeds. It reduces shock and undue stresses when the piston contacts the cylinder covers. Some users try to use the cushioning arrangement as a flow control device but it is not designed for this purpose. While standard hydraulic cylinders have cushions of lengths between one and two inches depending on design, there are many instances where this length is not long enough. This is especially true on cylinders which have extremely heavy loads on the end of the piston rods and the pistons are traveling at high speeds. Often it is necessary to use cushions of 6 and 8 in. lengths to secure the proper cushioning.

Long cushions are of several designs, some having long tapers, others with tapered V grooves, and still others with a number of metering holes which are closed off one at a time as the cushion nose enters the cushion bushing. The latter type has solved some very tough cushioning applications.

The manufacture of very large hydraulic cylinders presents problems which are more complicated than appears on the surface. For example, take a cylinder of 14 in. bore with a 20 ft stroke having a piston rod of 7 in. diameter. It not only requires large equipment to manufacture such a cylinder but it takes very accurate equipment. The cylinder tube must be honed to close tolerances and the bore must be straight from end to end within close limits. The grinding of the piston rod must be very accurate as it must pass through packings which will not tolerate any great tolerance without leakage. This rod must also pass through the large cover bearing without binding. Material procurement on such large cylinders is another problem. Delivery of material is exceptionally long due to the fact that large sizes are rarely stocked in warehouses and must be purchased from the mills.

Figure 3 shows a special hydraulic cylinder used in large industrial plants. It has a 14 in. bore cylinder with a 237 in. stroke. The piston rod is of 5 in. diameter stainless steel. The over-all length of the cylinder in the extended position is over 500 in.

Maintenance of hydraulic cylinders is not a tough job if they are kept clean inside and outside and packings are kept in good condition.



Reynolds Alloys Co.

**Fig. 3. Special hydraulic cylinder has a 14 in. bore with a 237 in. stroke. The piston rod is 5 in. in diameter and the over-all length of the cylinder is over 500 in.**

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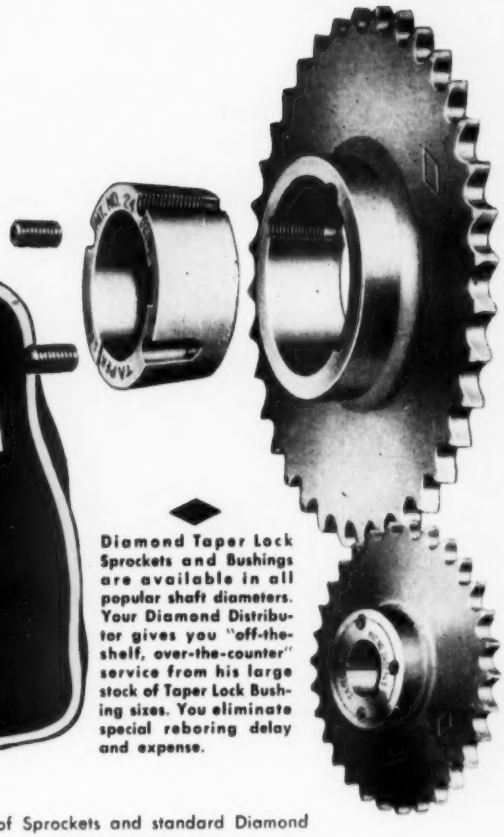


**Diamond Taper Lock Sprockets and Bushings are available in all popular shaft diameters. Your Diamond Distributor gives you "off-the-shelf, over-the-counter" service from his large stock of Taper Lock Bushing sizes. You eliminate special reboring delay and expense.**

A Complete, balanced, attractively priced stock of Sprockets and standard Diamond Roller Chain is now available for fast "off-the-shelf, over-the-counter" service.

Taper Lock Sprockets and Bushings in the larger sizes are available with a full assortment of finished bores for all popular shaft sizes.

In the smaller sizes, solid Sprockets with finished bores in all popular sizes complete with keyways and setscrews are available.

**In the smaller sizes, solid Diamond Sprockets with fixed stock bores for all popular shaft sizes are available complete with Keyways and Setscrews.**

Now the correct Sprockets and high quality Diamond Roller Chains for new applications and replacements are as near as your telephone.

Your Diamond Distributor can furnish you Diamond Sprockets, Roller Chain and complete drives to meet emergency and normal service demands for all standard drive ratios and popular horsepowers — *from stock!*

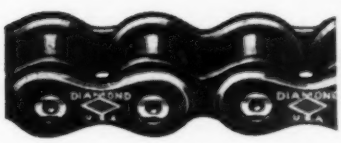
See the classified section of your local telephone directory for the number and address of your neurest Diamond distributor.

**DIAMOND CHAIN COMPANY, Inc.**

*Where High Quality is Traditional*

Dept. 614, 402 Kentucky Avenue, Indianapolis 7, Ind.

*Offices and Distributors in Principal Industrial Centers*



**DIAMOND** **ROLLER CHAINS**

**For more facts circle 559 on Reply Card**

Arc-shaped slip form on iron framework, bracketed by green concrete (left) and reinforcing mesh (right) ready for pour

# ARC-SHAPED SLIP FORM Filled 7 Times to Pour Water Tank

THE SAME FORM, used seven times, was the major factor in a time- and money-saving innovation used by L. H. Hoffman, contractor, on a recent water tank construction job. An adaptation of the slip-form method of pouring tank walls, the arc-shaped form was devised by construction supervisor Tom Creasy, on a job for the Weyerhaeuser Timber Company's new bleached kraft pulp mill at Everett, Washington. The tank was to be a large settling tank for purification of the process water in the mill.

Initial step in the construction of the tank was the pouring of the circular tank floor. A post was anchored in the center of the floor slab, about which the arc-shaped form was revolved as the subsequent wall pour was made.

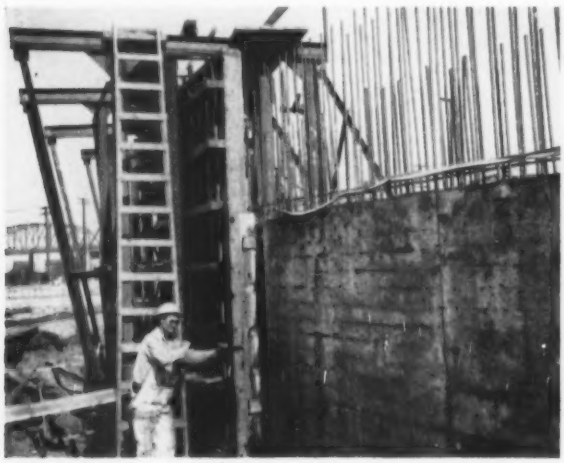
The form itself makes up the arc of a circle, and the framework which supports the form, tying it to the center post, makes up the sector between the form ends and the post.

After the reinforcing rods were installed, the form was moved into place, each end closed temporarily, and the first pour was made. When this pour had set sufficiently, the end closures were removed, and the form was moved around the circumference of the circular tank floor to a new position adjacent to the first poured section. The form movement was facilitated by mounting it on a series of wheels, approximately 10 in. in diameter, which roll around the periphery of the concrete tank floor.

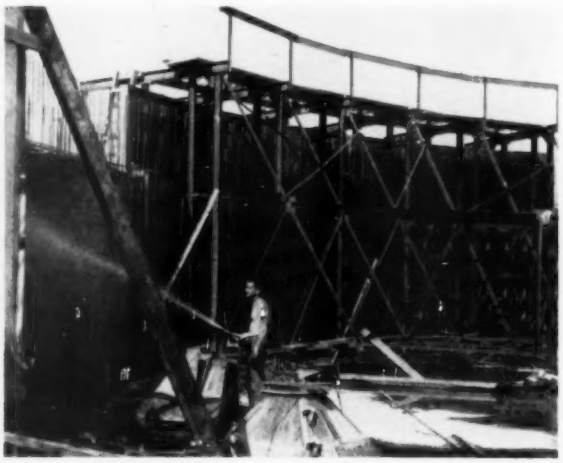
When the form had been moved around far enough to clear the end of the first pour, the ends were again closed, and the second pour was made in the same manner as before. This process, repeated seven times, completed the full circular wall around the tank.

A small gap was left between adjoining poured segments, to permit working on the form ends, removing and reinstalling the temporary closures.

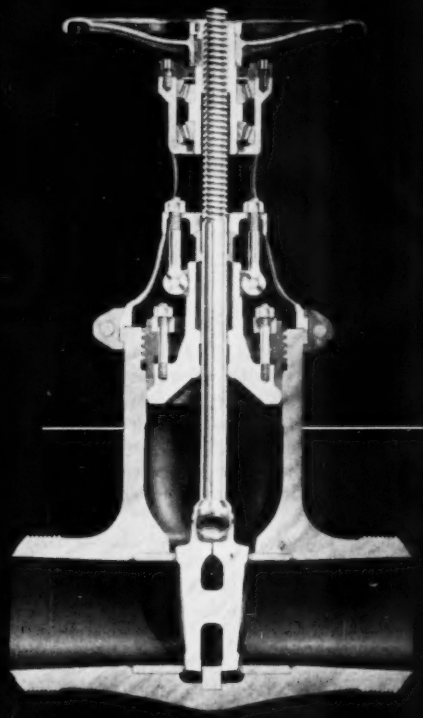
After the segments were ready for finishing, these gaps were formed and poured to complete the tank wall, with each pour incorporating a copper sheet expansion joint. A similar copper joint was placed between the tank floor and the wall.



Workman removes end closure from form after concrete sets, prior to move into new position for pouring next wall section



Structural iron framework supports form as newly-poured arc of concrete sets. Section at left is wet down for curing



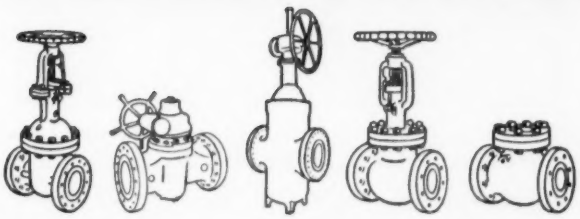
# STEEL

**COMPLETE LINES OF CAST STEEL VALVES AND PIPE FITTINGS** are manufactured by Walworth in a variety of pressure classes, types, sizes, and patterns for general industrial use. Walworth also manufactures cast steel valves for specific service applications.

Walworth produces steel bar stock valves, and cast steel valves made of carbon steel, carbon molybdenum steel, corrosion-resistant, and heat-resistant alloy steels. Included are gate, globe, angle, check, and lubricated plug types. Sizes range from ¼ to 30 inches; pressures range up to 5,000 psi. Full information is contained in Walworth General Catalog 52, a copy of which will be forwarded if requested on business letterhead.

Walworth also manufactures complete lines of valves and fittings made of bronze, iron, and special alloys as well as steel. Walworth-made valves, fittings, and pipe wrenches total approximately 50,000 items.

Walworth engineers will be glad to help you with your problems. For full information, call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, New York.



Illustrated in section is an 8-inch Series 900, Walworth Pressure-Seal Cast Steel Gate Valve designed for high-pressure, high-temperature service. Pressure-Seal Valves are available in Series 600, 900, 1500 and 2500; sizes 1 to 16 inches. Small Cast Steel Valves, Series 1500, in angle and Y-globe types, are also available in sizes ranging from ¼ to 2 inches.

**WALWORTH**

*Manufacturers since 1842*

**valves . . . pipe fittings . . . pipe wrenches**

**60 East 42nd Street, New York 17, N. Y.**

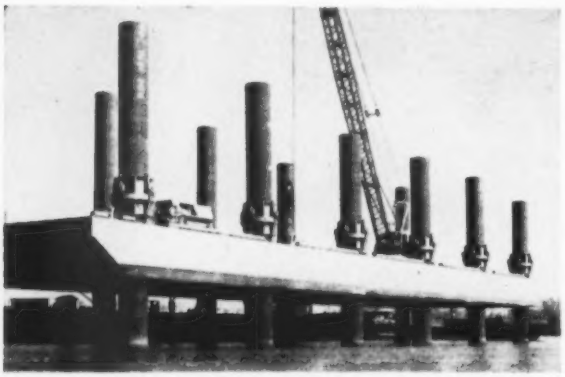
**DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD**

**For more facts circle 560 on Reply Card**

## Giant Steel Barge "Shinnies" Up Columns to Become Dock

**The simple mechanical principle** by which a small boy shinnies himself up a tree trunk has opened up a vast new field of steel fabrication.

Engineers and steel fabricators have put the same tree climbing principle to work in a complex jack mechanism and designed around the jack a new steel dock for harbor and drilling installations. The unique dock is built as a barge, floated to its destination, "shinnied" up legs that it carries along, and installed as a permanent steel-strong dock. Yet it can pick itself up, hook onto a tug and be towed to a new location.

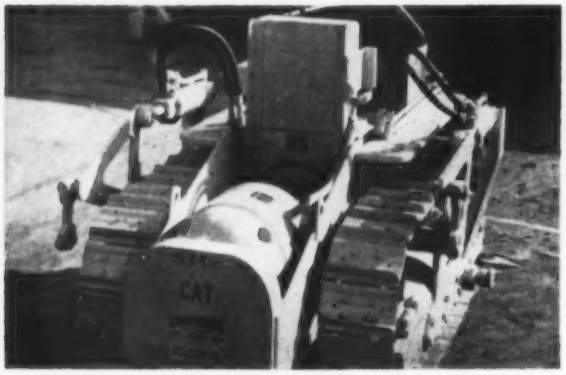


Consolidated Western Steel, a division of U. S. Steel Corp., has taken the lead in fabrication of the big barges, and at its Orange, Texas, plant last year built three of the steel giants.

Designed by Col. Leon B. DeLong, chief of DeLong Engineering & Construction Company of New York City, the docks already have proved extremely important to military operations. Besides their mobility, the sections can be used singly or erected end-to-end and welded together into a single dock of any desired length. Some of the barges are now serving as a dock in Greenland.

Sections of the barges were towed individually more than 2,000 miles across the Gulf of Mexico and up the Orinoco River in Venezuela to Puerto Ordaz, there erected into a single loading dock for the ore terminal of Orinoco Mining Co., sister unit of U. S. Steel that is developing the Corporation's iron ore deposits there.

## Caterpillar Tractor Sports New "Nose" for Exhaust-Free Drive



**A special Caterpillar bulldozer** has been powered electrically to eliminate dangerous carbon-monoxide exhaust gases in an aqueduct tunnel-building project in the State of Washington.

A General Electric motor was installed to replace the conventional internal-combustion engine whose exhaust fumes would be harmful to the tractor operator and other personnel working in underground spaces.

The 40-hp, 900-rpm motor drives the regular transmission with four speeds forward and one reverse. It operates on 220/440 volts supplied by a trailing cable from outside the tunnel shaft.

The bulldozer is equipped with a curved grader blade on the front just ahead of the motor and will be used to put the finishing grade in the tunnel after the mucking machine has finished its work.

## Portable Steam Generator Powers Percussion Drill on Field Sites

**Drilling through granite** at the rate of 45 ft per hour is the performance record of a new Bassinger Percussion drill, which recently drilled a 4½-in. diameter hole through a 32 in. block of granite, in 3 min. 35 sec.

The drill, operating basically like a double action pile driving hammer, is powered by 400-lb steam supplied by a portable Vapor-Clarkson steam generator, manufactured by the Vapor Heating Corp., Chicago. Using 2400 lb of steam per hour, the drill makes up to 3000 strokes per minute, and the exhaust steam carries away the chips from the drill. As the drill goes down into the hole, extra lengths of pipe are added to deliver the steam to the drill.

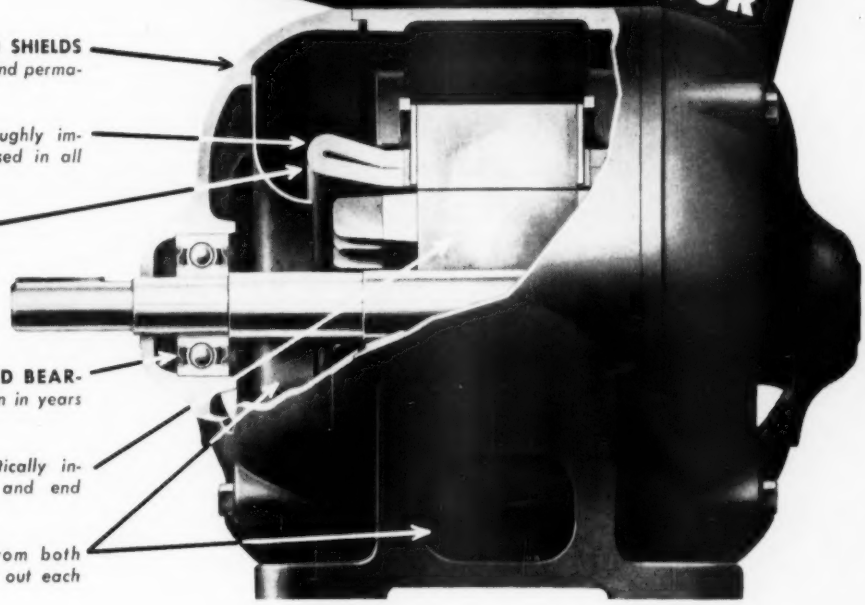
The drill itself, exclusive of the framework needed to support it in position, is a small device about 5 ft long and less than 4 in. in diameter.

The drill bits are solid, with tungsten carbide inserts provided to withstand the impact on the bit. The bits are center-bored, to provide an opening for the exhaust steam to get to the drill face.

The entire unit, including the oil-fired steam generator, is portable, and can be readily moved to field locations for test boring, well drilling or blasting.

# Reliable?— well, check these features in the...

## ELLIOTT CROCKER-WHEELER SQUIRREL-CAGE INDUCTION MOTOR



**RIGID GRAY IRON END SHIELDS** *for solid bearing support and permanent alignment.*

**VINYLASTIC WIRE** *thoroughly impregnated and baked, used in all stators.*

**CORDED END TURNS** *for strength and permanence and phase-to-phase insulation to give further assurance of long life.*

**SEALED PRELUBRICATED BEARINGS** *needing no attention in years of service.*

**ALUCAST ROTORS** *practically indestructible — bars, fans and end rings are one solid piece.*

**DUAL VENTILATION** *from both ends of rotor, discharged out each side of the frame.*

Isn't this what you want in a good general-purpose motor —one that will require no babying nor special attention while in service on machine tool, process apparatus, fan, blower or pump? Here is sound dependability based upon solidly established past performance in applications of all kinds. Here is a motor that has passed every service test, thousands of them, tough as they come.

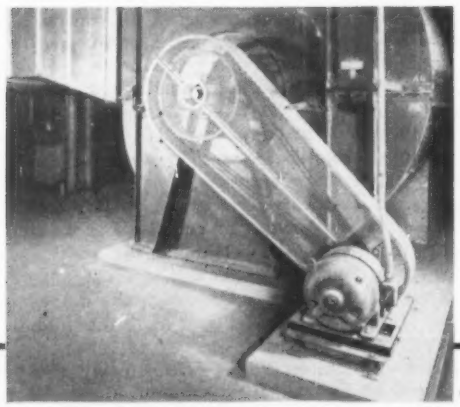
Another thing—this motor with all its rugged qualities, is available in all standard mountings—horizontal C face mounting, frame with feet — vertical flange mounting, with built-in C-W brake, in open drip-proof or splash-proof enclosure. In NEMA frames 203 through 505.

Put this Elliott Crocker-Wheeler motor wherever you want it, and say good-bye to motor troubles.

*For full data on this and other Elliott C-W motors, contact your local Elliott field engineer or write Elliott Company, Jeannette, Pa.*

### *RIGHT FOR AIR CONDITIONING*

Here is one of 95 of these C-W motors in a new air-conditioned skyscraper. This one of 15 hp, drives a big return fan.



W3-2

**ELLIOTT Company**

**CROCKER-WHEELER DIVISION**

**For more facts circle 561 on Reply Card**

## Freight Car Loading Pre-Planned with Model Load Units

**By arranging scale models** of shipping crates on scale freight car outlines, loading crews at TEMCO Aircraft Corp., Dallas, Texas, are able quickly and accurately to plan loads before crates are moved to the shipping dock.

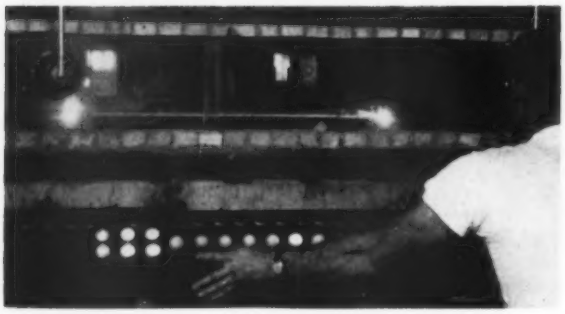
Prior to the development of the system, freight car load planning was difficult and time consuming, due to the variety of crate sizes and shapes used. Loading was slow and crates occasionally had to be removed from cars and reloaded in different positions.

The load planning system utilizes scale outlines of standard freight cars and models—made to the same scale—of each crate size used. Thus the entire load may be accurately planned by merely shifting the model crates on the freight car outlines.

Scale models of crates are made by sawing blocks of wood to size and, since a relatively few different crate sizes are used, a number of models of each crate may be kept on hand. Loads are planned by arranging these models on scale outlines of freight cars.

By noting the location of the model crates, the loading crews can determine the order in which the crates should be loaded, thus eliminating incorrect loading and speeding the entire loading operation.

## High Voltage Fuses Panes to Produce All-Glass Dual Pane Windows



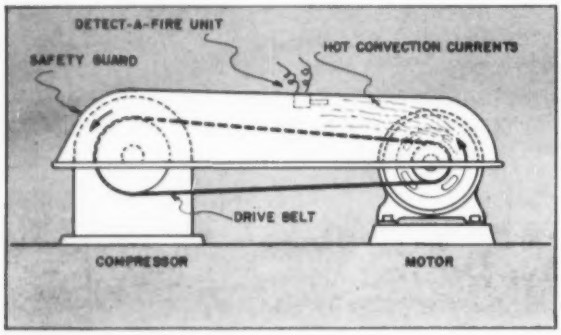
**A high voltage** electrical charge fuses the edges of two panes of glass together to provide an all-glass insulating window, called Twindoweld, being produced by Pittsburgh Plate Glass Co., at its Lincoln, Ill. plant.

The fusing of the edges produces a glass-to-glass seal, having no metals, bonding materials or assembled parts in its construction. The completed window panes consist of two layers of ⅛-in.-thick glass separated by a 3/16-in. air space. Air between the two panes is exhausted, and replaced with dried air. During this replacement, internal pressure is built up between the panes, sufficient to withstand atmospheric pressures in any location, in altitudes under 3000 ft.

## Heat Detection System Hunts Fires on Belt-Driven Equipment

**The danger of fire** around compressors and other belt-driven equipment has been eliminated in the supermarket chain of Penn Fruit Co. by the use of a shut-off circuit operated by a heat detecting unit.

In this system, the heat detector is mounted just above the compressor drive belt. When either the motor or the belt overheats because of an overload, belt slippage, or a frozen shaft, the malfunction generates heat which is carried to the detector by convection currents.




The detector contacts, which control the power circuit through a 110 or 220 volt solenoid, then open and cut the power to the entire compressor system.

The superintendent of maintenance for the company, who designed the system, states that in the year since the detectors were installed on 75 refrigeration and air conditioning compressors in the 26-store chain:

No compressor belt fires have occurred, in contrast to an average of 5-6 fires occurring yearly for the preceding 15 years; the spoilage of merchandise from sprinkler water damage has been eliminated; equipment malfunctions show up as overheat conditions which are detected before the motor or compressor is ruined.

Experimentation to find the proper location for the detectors showed that they responded most quickly when mounted about midway between the motor and compressor. The detectors on indoor compressors were set to break the circuit at 140 F, well under the ignition temperature of the belts, but high enough to avoid false alarms in summer. On outdoor compressors, the detectors are set to actuate at 180 F because of the high ambient temperature in summer.

The Detect-A-Fire units employed in the installation were manufactured by Fenwal, Inc., Ashland, Mass.

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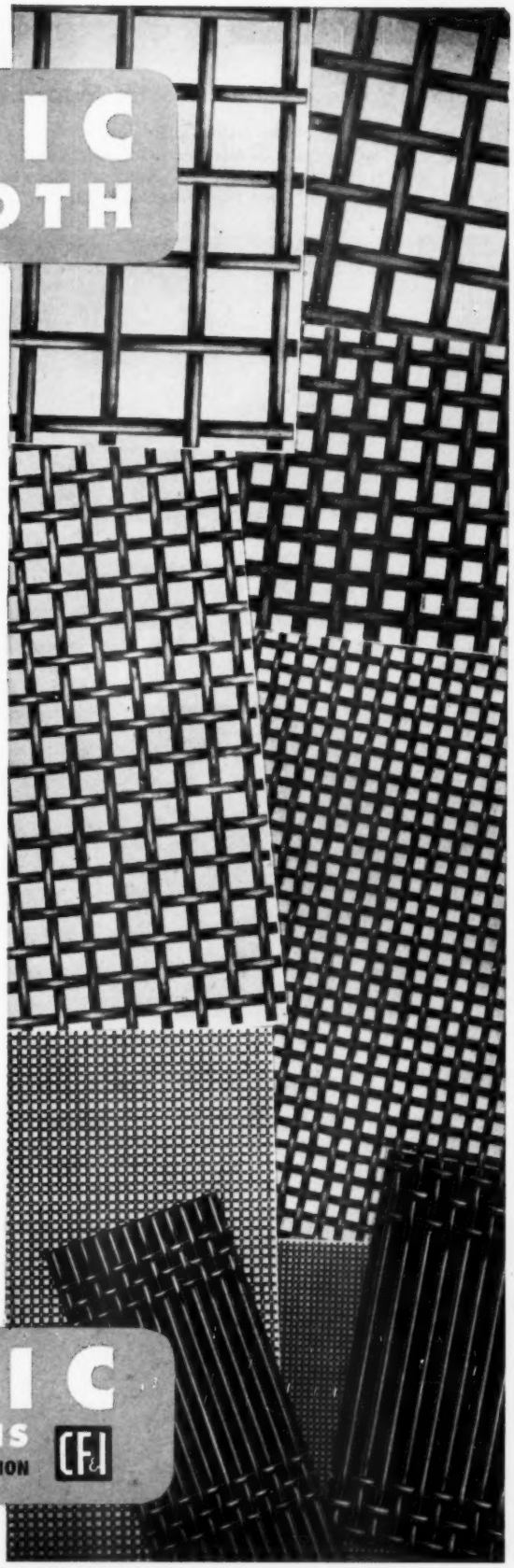


# CAL-WIC INDUSTRIAL SCREENS

THE COLORADO FUEL AND IRON CORPORATION

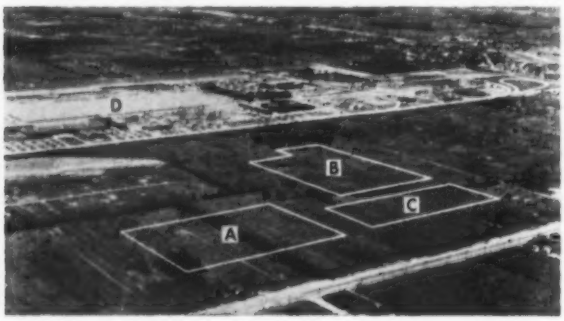
CFI

1250

For more facts circle 562 on Reply Card

## General Motors Technical Center Maps Expansion of Facilities

**The outline** for one of the nation's greatest meccas of research, engineering and development is taking shape north of Detroit. There, the General Motors Technical Center is already 50 per cent completed and addition of two more major components has been announced—Chevrolet Engineering and Fisher Body Engineering and General Offices.




Three hundred twenty acres are now occupied by the GM staff organizations.

To the southeast of the GM Technical Center, area D, both Fisher Body and Chevrolet will set up new engineering bases. Fisher Body will occupy 192 acres with 3 buildings, capable of housing an estimated 5,000 employes. The area marked A shows where Fisher Body Engineering and General Offices will be situated; the area marked B outlines the new headquarters scheduled for Chevrolet Engineering; the area marked C will be location of an artificial lake to beautify the landscape.

Chevrolet's plans call for 3 buildings—an experimental laboratory with a battery of dynamometer test cells, an administration building and engineering shops.

The Technical Center will employ an estimated 3,500 scientists, engineers, researchers and other specialists.

## Two-Ton Magnetizer Operates "On the Beam" to Make Speakers

**One of the largest**—2½ tons—magnetizing units in any radio manufacturing plant in this country, is in operation in the loudspeaker assembly line in the operation in the assembly line in the Stromberg-Carlson Company's Sound Division, Rochester, N. Y.

The electromagnet was designed especially for magnetizing the 10½-lb piece of Alnico V that serves as the permanent magnet in the company's 15-inch high fidelity loudspeaker.

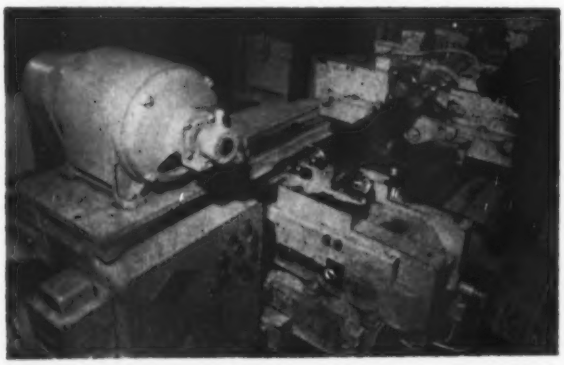
The magnetizing unit consists of a steel yoke, supporting the two pole pieces, which are 1 ft in diameter. Each of the pole pieces is wound with three coils, and each coil contains 1,450 turns of No. 12 cotton-enamel copper wire.

The electromagnet is activated by a self-excited generator which supplies 50 amperes, at 300 volts.

Activation of the electromagnet's coils is controlled by an electric eye, so placed that a loudspeaker passing through the magnet's gap interrupts the beam of light as the speaker approaches the center of the gap. That switches current into the coils. A time switch, which can be adjusted, cuts the power off.

## Burnishing Machine in Car Shops Beats "Hot Boxes" at Their Source

**Automatic machine burnishing** has been adopted for finishing car wheel axle journals in the Glenwood shops of the Baltimore and Ohio Railroad in Pittsburgh. For this purpose a heavy-duty end-drive hydraulic operated burnishing lathe of new design was installed. The lathe is a development of Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.



Burnishing, formerly a manual operation on axle turning lathes, is now done as an almost completely mechanized operation. Predetermined pressure is applied hydraulically and automatically held constant on the burnishing wheels while the axle is motor driven at 220 rpm and the selected feed speed is maintained between 1 and 20 in. per minute. An operator can burnish both journals of an axle at the same time and finish up to 10 axles per hour. Average output for an 8-hr. shift is 65 axles.

Hydraulic devices under finger tip control position the axle in the machine, move the headstock driving plate and tailstock center against the ends of the axle with enough hydraulic pressure for the driving plate to turn the axle by means of frictional contact, and press each set of burnishing rolls against the axle at the desired pressure.

# ...with TYCOL lubricants on hand!

**Heavy-duty cutting operations?** Here's what happens when you switch to Tycol Afton oils! A well-known Engineering Company (you'd recognize the name instantly) recently tested cutting oils used to shape 14" gears on a Gleason Bevel Gear Generator. Their findings: after the first rough cut around, with competitive oils, they had to grind a full ⅛" off the cutter. With Tycol Afton 8, they hobbed *two* gears and took off only .013". Afton oils are non-corrosive . . . and so stable they're widely recommended as hydraulic oils! They serve a triple function as coolants, lubricants, and hydraulic media on the same machine . . . the heavier the cut — the better they perform. It will pay you to find out why — by contacting your local Tide Water office!

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INDUSTRIAL LUBRICANTS

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17 BATTERY PLACE - NEW YORK 4, N.Y.

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

**For more facts circle 563 on Reply Card**

# NEW PRODUCTS & PROCESSES

summarized for your convenience

*Edited by M. E. Heniken*

## 1—INSULATING WOOL is reinforced with glass fibers

Duramat is made from glass fiber reinforced with parallel strands of glass yarn and coated with special waterproof asphaltic materials. Suggested applications include use as a vapor barrier under basementless buildings and in refrigerated rooms, and as a covering and weather sealing for above ground insulated pipes and exposed ducts.

The reinforced glass fiber mat is said to give this material added strength and make it tear and puncture resistant. It is flexible, bends around curved or irregular surfaces and conforms to ground contour. Company says it won't rot or deteriorate. Available in two thicknesses, Type 252 has a nominal weight per 108 sq ft of 51.8 lb, comes in rolls 36 in. by 36 ft. Type 251 has a nominal weight of 23.5 lb, comes in rolls 72 ft long. Glass Fibers Inc.

## 2—DRUM HANDLING DEVICE holds drums horizontally

A horizontal drum handling attachment interchangeable among this manufacturer's line of fork trucks is announced. Semi-automatic, it adjusts itself to a variety of drum sizes for horizontal lifting and tiering. It is built to handle drums from 26- to 38-in. long, empty or full, singly or in pairs. They are projected ahead of the truck directly parallel to the truck's movement. Drums may be tiered or untiered from horizontal nested position unhampered by side or bottom arm projections.

The handler, of steel construction, consists of two parallel arms with self-actuating levers projecting forward for horizontal drum grasp. Its over-all width is 26½ in. and it weighs approximately 300 lb. It requires no tools for mounting or dismounting, is suspended from standard fork trucks which are inserted into the two channel-supports forming an integral part of the handler. Clark Equipment Co.

**More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 35-36 and 169-170.**

## 4—FUSE LINKS offer new interchangeability feature

This complete new line of EEI-NEMA standard distribution fuse links is electrically and mechanically interchangeable with other makes of EEI-NEMA standard fuse links, manufacturer announces. Features of the new links include low melting temperatures for preventing cutout damage; continuous current carrying capabilities in excess of ratings; and long auxiliary tubes for better full-range operation of cutout.

Both Type K (fast) Fuse Links, with ratings from 1 to 200 amp, and Type T (slow), with ratings from 6 to 200 amp, are included in the new line. Time-current curves, co-ordination charts and conversion procedures are available to assist in a changeover to the new links. General Electric Co.

## 5—HYDRAULIC CONTROL HOSE for up to 5000 psi

This high-pressure hydraulic control hose is reinforced with fine, high tensile steel wire to give maximum flexibility and burst resistance under shock loads. This flexibility is retained at temperatures from -40 to 250 F, company says, and the rubber tube is compounded to resist all popular hydraulic fluids. The cross-wrapped rubber cover protects the carcass against weather, mildew, oils, greases and fumes. The hose is also available with a rubber impregnated cotton braid cover, similar to military specification hydraulic control hose. Quaker Rubber Corp. Div., H. K. Porter Co., Inc.

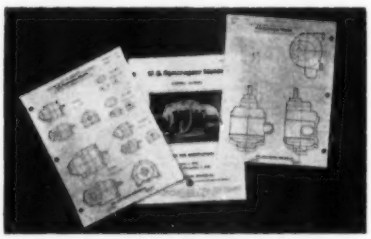
## 6—STORAGE UNITS handle lengthy bar, pipe, rods

These steel storage units are easy to load and unload and provide a means of storing lengthy material in minimum space. They are available in double face models for center or open floor

use, and in single face models for use against a wall. They're finished in green baked-on enamel. Lyon Metal Products, Inc.

## 7—GEARMOTOR DRAWINGS save time for layout man

Scale drawings of this manufacturer's Syncrogear line are available drawn in a simplified style but to exact scale. They are designed to be inserted under a layout of a machine, or other equipment and traced in the proper size and position. Five scales are provided



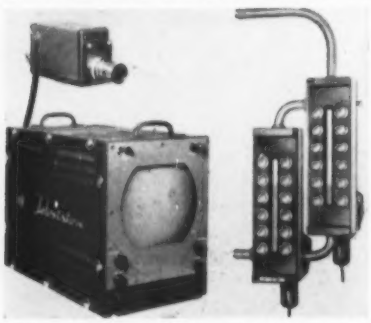
for each motor ranging from ½ in. to the foot to 3 in. to the foot. The drawings are on punched 8½-by-11 in. paper for insertion in a three-ring binder.

Three views are included of each of the 30 motors shown. Single and double reduction Syncrogears as well as worm type units are scaled for tracing, and a booklet of specifications, dimensions and weights will be sent with the drawings. U. S. Electrical Motors Inc.

## 8—CARBIDE TIPPED DRILL for boring holes quickly

Boring holes in concrete, brick, plaster and other materials encountered in building construction maintenance is described as a simple, quick operation with a new type self-cleaning drill tipped with tungsten carbide. A spiral flute automatically lifts dust out of the hole as it rotates to eliminate clogging and stalling. The drill comes in a full range of commonly used sizes

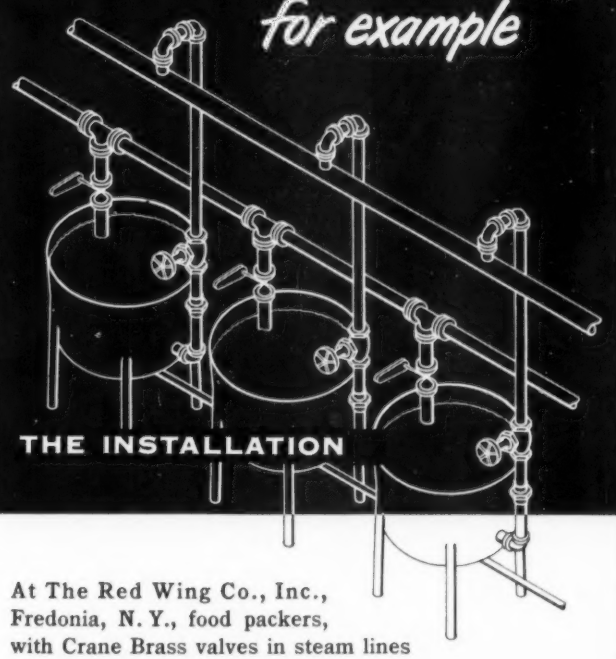
## 3—TELEVISION EQUIPMENT for boiler water gage installations



The camera is shown at top, with monitor unit (below left) and gages

Television of Yarway Pressure Sealed Flat Glass Gages is now available, as a result of an arrangement between their manufacturer and Radio Corp. of America. This new application of RCA's industrial television to boiler water gages is designed to bring "live" gage readings down to the operating panel or any other convenient location in the boiler plant. The television image is transmitted from the small, light-weight camera to the viewing monitor by a single cable. This simplified two-unit chain is standard RCA equipment and the special camera base provided, also furnishes proper lighting of the gages. Yarnall-Waring Co.

# How Better Quality Valves Pay Off ...on Steam Throttling, for example



THE INSTALLATION

At The Red Wing Co., Inc., Fredonia, N. Y., food packers, with Crane Brass valves in steam lines to juice heaters and cooking kettles.

## VALVE SERVICE RATINGS

**SUITABILITY:** None better for throttling

**MAINTENANCE COST:** No expense here

**SERVICE LIFE:** No sign of wearing out after 4 years

**OPERATING RESULTS:** Precise control of steam to cookers

**PRICE:** Bigger value than any other valve used

**AVAILABILITY:** Regular Crane Catalog Item - No. 212P

## THE CASE HISTORY

At least once a week there was valve trouble in the cooking room. Leaky valves . . . disc and seat cut out . . . steam to kettles out of control.

New valves made little difference; none could stand the severe steam throttling. Not until Crane plug-type disc valves were installed.

Immediately the valve trouble stopped as did the cooking interruptions. Not even the plant operator believed it possible. In use now more than 4 years with no maintenance cost, the Crane No. 212P valves are still in like-new condition. They show no erosion, no leakage; and they operate freely.

## THE VALVE

Designed expressly for severe throttling service, these Crane brass valves have plug type disc and seat of Crane Nitri-Hard stainless steel. Seating surfaces are practically impregnable to damage by cutting, erosion, etc. Disc taper permits close flow regulation. For any kind of throttling look into these valves for 150, 200, and 300-pound steam services. Your Crane Catalog or your Crane Representative will give you all facts.

*THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON*

# CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
*Branches and Wholesalers Serving All Industrial Areas*

**VALVES • FITTINGS • PIPE • PLUMBING • HEATING**

**For more facts circle 564 on Reply Card**

# NEW PRODUCTS

(Begins on page 122)

from 3/16 in. and up. Sizes from 3/16 to ½ in. fit a ¼ in. chuck; and the ½ in. drill and larger sizes are available with ½ in. shank. Carboloy Dept., General Electric Co.

### 9—RUBBER TILE FLOORING is easily installed, economical

Standard Gage KenRubber is being introduced as a companion material to this manufacturer's heavier KenRubber and is intended for applications where a lighter weight, less costly rubber tile flooring is desired. It will be available in 9-by-9 in. and 6-by-6 in. sizes, and contains exactly the same raw materials as the heavier ⅛ in. tile.

Being lighter in weight and somewhat easier to handle than the heavier KenRubber, this new product is not only less costly to buy but also cheaper to install, company points out, since it is especially adaptable for self-installation. As in the heavier flooring the colors go all the way through the material and are practically fadeproof. Nine colors are available in the new tiles. Standard Gage KenRubber may also be had in 36-in. strips, 1-in. wide, in four art colors. Kentile, Inc.

### 11—TRANSMITTER for simplifying flow measurement

Developed as a solution to the problem of close-coupled fluid flow measurement, liquid level or other installation requiring differential pressure measurement and transmission, the Transaire Transmitter is a force-balance designed to convert differential pressure into an equivalent 3 to 15 psi output. It can be used to measure flow, liquid level or specific gravity.

The transmitter has two basic units. The primary unit senses differential pressure and consists of a two-part forged steel or stainless steel housing enclosing a Teflon-coated, glass-fabric diaphragm. The inner housing of this unit is shaped to the contour of the diaphragm to permit full over-range protection of 1500 psi to either side of the diaphragm. A secondary unit transmits proportional output air pressure and incorporates a ruggedly constructed, pneumatic force-balance transmitting system. This unit is enclosed in a cast-aluminum cover, self-purged to keep out corrosive vapors and dust.

Advantages announced for the instrument include simplicity of installation, maintenance and adjustments range, and a built-in damping device designed to provide true average damping with pneumatic stability. Detailed information is given in Bulletin 98226. Taylor Instrument Companies.

## New Aids to Make Quicker Work of Tough Cleaning

### 10—PORTABLE CHIPPER takes off rust, paint, mill scale

The Hand Revo-Tool, a ¾ hp high speed chipping tool, measures only 9 in. wide—yet is said to clean 100 sq in. in one 25-in. pass. It is designed for cleaning metal, concrete, brick,

plaster and similar surfaces. The chipping and cleaning action is provided by 102 hardened steel cutters in fast rotating cutter bundles. These cutters shear off hard accumulations from pipes, tanks or vats, decks, girders, walls, floors and around machines.

Company says that this tool lets one man do as much work as a several-man hand scraping crew, and that it cleans many metal surfaces for repainting at much less cost than mechanical methods. Also, its compact size makes it useful in hard-to-reach areas.

The tool's operation is simple; you press a trigger type switch to start the cutters, then guide the machine over the surface to be cleaned. Cutting depth of the two 2¼-in. 2000-rpm cutter heads is controlled by an adjustment shoe, and a steel hood protects against flying chips. It is available with pneumatic or electric motor. The pneumatic model is 14½ in., weighs 16 lb. The electric model is 16 in. long, weighs 24½ lb. G. H. Tennant Co.

### 12—CLEANING SPRAY does a lot of industrial jobs

Applied by a hand pressure spray gun, Spray White is announced as the "first universal cleaner." It is said to remove grease, oil, wax, gums, dirt, dye, ink, cutting soap and other substances with safety to all metals, plastics, rubber, porcelain, composition, concrete or wood, when used according to directions. And it is claimed to clean quickly without heat, odor, fumes, fire-hazard or danger to skin.

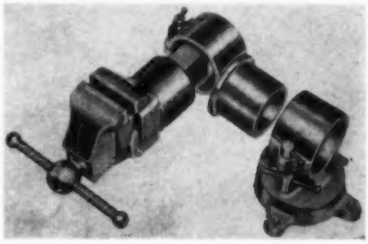
Most cleaning jobs are done merely by spraying-on and wiping-off the

Spray White. The spray gun utilized is charged with air pressure from any source, can be refilled quickly and holds enough Spray White for several hours of average cleaning. Bulletin 126 provides details. Kelite Products, Inc.

**To receive product data circle item numbers on the handy Reader Service Cards on pages 35-36 and 169-170.**

### 13—ROTATING VISE, 360-deg flexibility for bench work

Designed to provide complete rotation of 360 deg in any direction, the Flexivise has three major adjustments to facilitate work handling. First, the entire vise assembly may be rotated around, clockwise or counter-clockwise. By means of a swivel base that locks in any position, the vise may be turned right or left in a complete circle.



The third adjustment is made possible by a Flexisleeve, a special attachment designed to give the Flexivise endless positioning range.

For working large and heavy pieces the jaws of this vise may be turned so the work can be set on the bench itself while being held by the jaws. Also, large, unwieldy pieces of work may rest on the floor while the Flexivise holds them for work processing. This vise has a 4-in. jaw size, with a 5½-in. jaw opening. Manufacturer says it provides the same gripping strength as conventional vises of corresponding size. Flexivise Co.

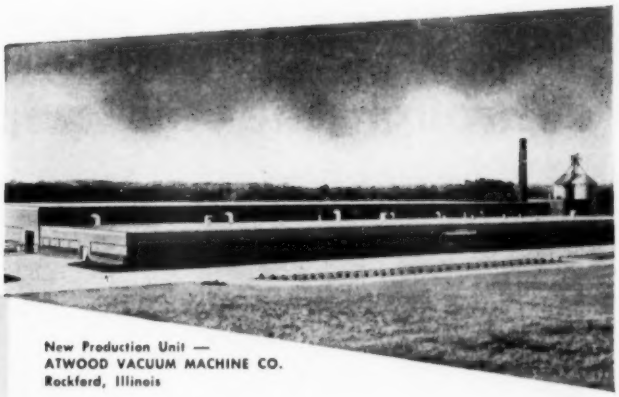
### 14—HUMIDITY CONTROL for air conditioning system

This instrument offers a means of controlling moisture content or relative humidity in air conditioning without the need for a moisture sensitive element to determine humidity, it is explained. The instrument is applied to company's method of air conditioning in which air is dehumidified by a liquid absorbent.

As the air conditioner removes moisture from the air stream passing through it, the absorbent liquid becomes diluted, and is continuously reconcentrated to remain effective. The amount of moisture permitted in the conditioned air is governed by the concentration of the absorbent liquid. This concentration is directly related to the boiling point of the mixture of absorbent liquid and water. Based on this principle, the new instrument consists of a tube with a heating element. A sample of the reconcentrated liquid on its return flow to the air conditioner continuously enters this tube and is heated to boiling point. A thermostat

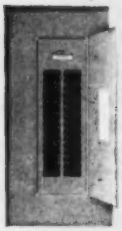
# For the Industrial Plant of Today and Tomorrow

## INSIST ON FA PRODUCTS

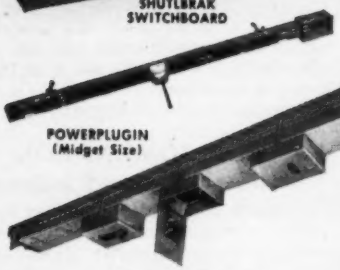


New Production Unit —
ATWOOD VACUUM MACHINE CO.
Rockford, Illinois

SHUTLBRAK SWITCHBOARD



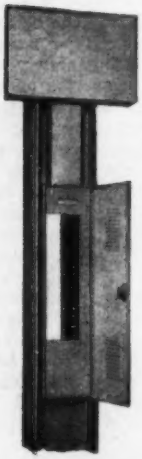
QP QUICKLAG PANELBOARD



POWERPLUGIN (Midget Size)

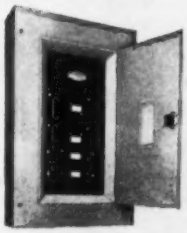
POWERPLUGIN

SCA ENCLOSED SHUTLBRAK SWITCH



COLUMN TYPE PANELBOARD

DUSTITE PANELBOARD



PULFUZSWITCH PANELBOARD

Ⓕ PRODUCTS for the control and distribution of power and light have been specifically geared to the needs of the factory of today and tomorrow.

Besides being safe, efficient, dependable, economical, long-lasting and trouble-free, all Ⓕ switchboards, panelboards, busduct and other similar equipment used in modern industry, have been designed to provide the electrical capacity needed for today and allow for future expansion by the simple addition of necessary units.

If you are planning a new factory, or modernization and improvement of an existing plant — regardless of size — be sure that your electrical distribution system is suited to your needs. Install Ⓕ products — the equipment with a future.

For additional information, consult your nearest Ⓕ representative, listed in Sweet's, or write for bulletins.

*Frank Adam Electric Co.*

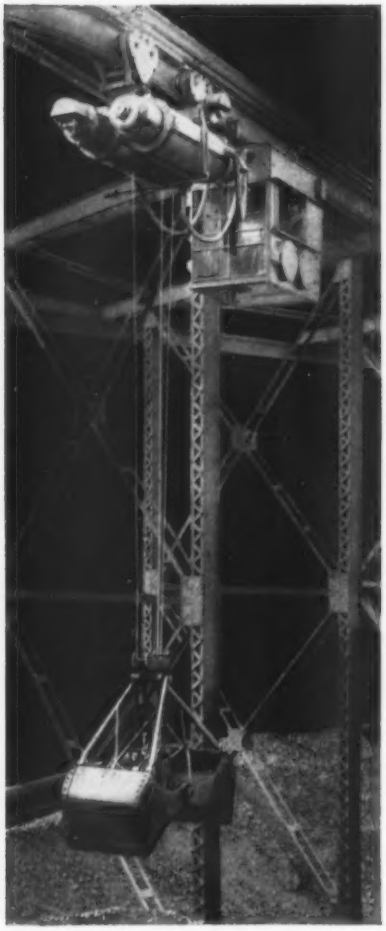
P. O. BOX 357
ST. LOUIS 3, MISSOURI

*Makers of:* BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETEP

**For more facts circle 565 on Reply Card**

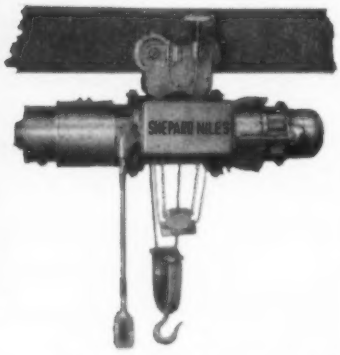
# *Cut handling costs...*

## *with* SHEPARD NILES
## Through-The-Air Equipment

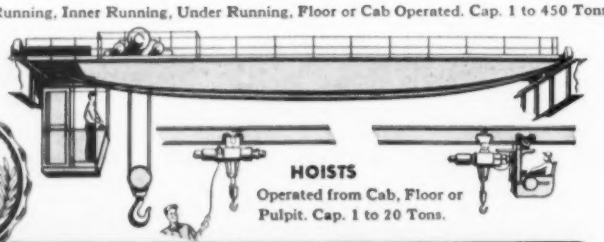


No system of handling serves your whole plant at less cost than thrifty through-the-air handling! With a Shepard Niles cab or floor operated hoist, you move heaviest loads swiftly, safely—eliminate re-handling—speed production—save manpower. At the same time, you put unused ceilings to work — make more space for machinery and storage.

Let thrifty through-the-air handling help you cut costs. Just make certain you select the right hoist! Call in the Shepard Niles representative to talk over this problem—he's a specialist in loads through-the-air. Send for Bulletin today describing Shepard Niles Monorail Hoists — and arrange to have a representative stop by.




**CRANES**
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated. Cap. 1 to 450 Tons.



50th ANNIVERSARY
SHEPARD NILES CRANE & HOIST CORP.
1903-1953

**HOISTS**
Operated from Cab, Floor or Pulpit. Cap. 1 to 20 Tons.

**SHEPARD NILES**
CRANE AND HOIST CORPORATION

**2230 SCHUYLER AVENUE, MONTOUR FALLS, N.Y.**

**For more facts circle 566 on Reply Card**


# NEW PRODUCTS

(Begins on page 122)

with its sensing element in the tube is set at the boiling point desired. The thermostat operates the concentrator unit to furnish a greater or less concentration of the absorbent liquid, as called for by the thermostat setting. Niagara Blower Co.

### 15—LUBRICANT TUBES for simplifying valve lubrication

Two newly designed lubricant tubes—a flat-top gun and a long-spouted bulk type—are available for more effective and economical lubrication of company's Nordstrom valves. With the flat-top tube, a lube-gun can be loaded quickly by cutting off the tube top and turning a key which squeezes the contents directly into the barrel. With the long-spouted tube, a valve lube chamber can be filled easier because the spout gets the lube further into the shank. Use of the spout tube also simplifies inventory control because one tube fits all Nordstrom valve sizes. Eight types of lubricants are available in the new tubes. Rockwell Mfg. Co.

### 16—TOOL COMBINATION of screwdriver and balancer

Claimed to be perfectly paired to boost assembly line efficiency, this twin tool combination includes the Model ES10 Screwdriver with a-c d-c 115 v, ball bearing motor (a 230 v model is available) and a tool balancer. The electric screwdriver has a lever type switch, normally off. The driving clutch engages when pressure is exerted on the bit. Reversing calls for a 45-deg turn on the knurled ring. Operating at 1200 free rpm, the disengaging torque may be varied by a simple setting of spring pressure. Capacity of the tool is for self-tapping No. 10 machine screw or non-tapping ¼ in. machine screw. It is furnished with a 10-ft rubber-covered cord.

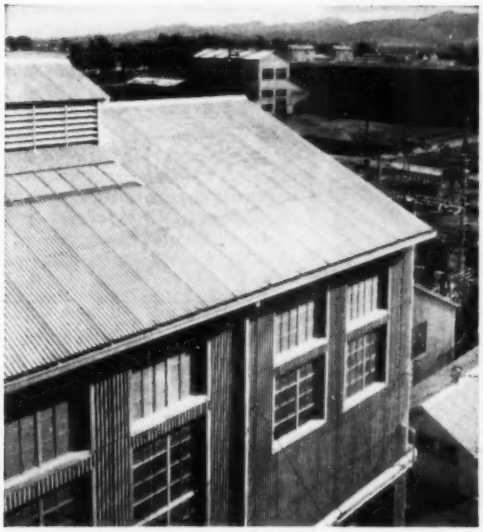
The tool balancer, mounted overhead, holds a 15-ft steel cable in a streamlined steel housing. It retracts when released. This balancer will also take a drill, nut runner, grinder or other portable tool weighing up to 10 lb. Mall Tool Co.

### 17—VARIABLE SPEED UNITS offer flexibility, economy

Flexi-Speed Drives may be mounted in almost any position around the driven equipment, may drive in any direction, and can deliver any desired speed within a ratio of 8 to 1, it is announced. Also, the driven shaft may be located anywhere around the motor shaft, and the speed control handwheel may be

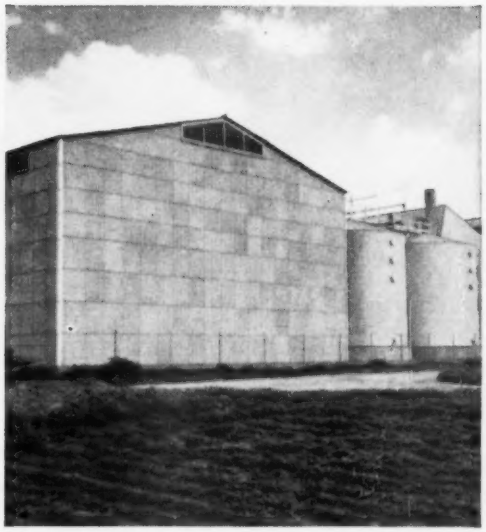
# CORRUGATED *Asbestos* TRANSITE*

**For Dependable Roofing**



The Johns-Manville Corrugated Transite roof of this oil refinery building will give many years of dependable service, provide protection against fire, and will remain unaffected by the severest weather conditions.

**For Economical Sidewalls**



Used as siding for this recently completed building, Johns-Manville Corrugated Transite will provide years of durable service and fire safety with a minimum of care. It needs no paint or special treatment to preserve it.

## You build economically and quickly with these versatile fireproof and weatherproof asbestos building sheets

In the past quarter century, Johns-Manville Corrugated Transite has proven an ideal material for roofs and for sidewalls of industrial, commercial, institutional and agricultural buildings. Made of asbestos and cement, the large sheets are easy to handle, go up quickly with a minimum of framing. Practically indestructible, Corrugated Transite is fireproof, rotproof, weatherproof, needs no paint or special treatment to preserve it, and can be salvaged and re-used if necessary.

Today, Corrugated Asbestos Transite is also used increasingly for smart interiors . . . the streamlined corrugations and attractive shadow lines that give it such unusual architectural appeal for exteriors offer unlimited interior design possibilities.

• • •

Investigate J-M Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. PE, New York 16, N. Y. In Canada write 199 Bay Street, Toronto, Ontario.

*Reg. U. S. Pat. Off.

EASY TO FASTEN TO STEEL

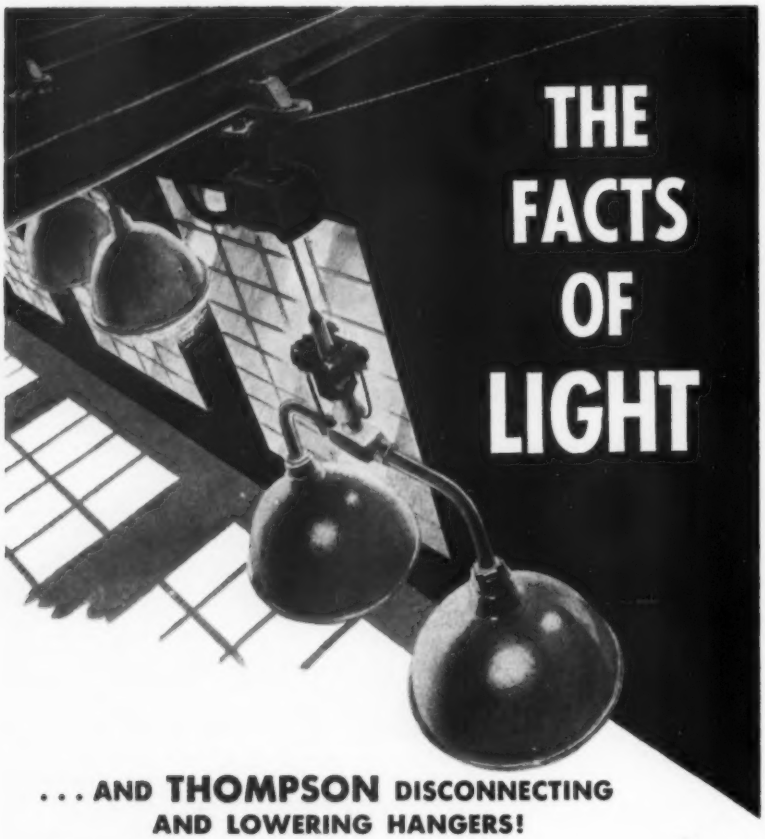
EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

**Johns-Manville** *Asbestos* **CORRUGATED TRANSITE**

**For more facts circle 567 on Reply Card**




**. . . AND THOMPSON DISCONNECTING AND LOWERING HANGERS!**

**FACT NO. 1:** Around-the-clock plant efficiency requires regular planned maintenance of lighting equipment.

**FACT NO. 2:** Only high-bay lights suspended from Thompson disconnecting and lowering hangers can be serviced easily and safely . . . at floor level.

**FACT NO. 3:** Plants equipped with Thompson hangers are setting records in safety. No ladders, scaffolding or hazardous practices are needed for luminaire maintenance . . . one man quickly cleans and relamps lowered fixture while standing on the floor. Electrical dangers are eliminated by Thompson hangers because lowered fixtures are "dead".

**FACT NO. 4:** Thompson disconnecting and lowering hangers cut maintenance costs by saving man hours . . . reducing accidents. One man can clean four times as many Thompson hanger-equipped lights per hour as two men servicing fixed-position lights by means of ladders or scaffolds.

*To learn the complete facts of light, write today for the new illustrated BULLETIN TH-52.*

130H-TE

1. DISCONNECT 2. LOWER 3. SERVICE 4. REPOSITION 5. REPEAT

**THE THOMPSON ELECTRIC CO.**

1165 POWER AVENUE • CLEVELAND 14, OHIO

For more facts circle 568 on Reply Card


# NEW PRODUCTS

(Begins on page 122)

located parallel to or in any of eight positions perpendicular to the motor shaft. Six belt lengths offer a choice of shaft center distances.

Described as inexpensive to install and maintain, these drives are available in ½-, ¾- and 1-hp capacities, adaptable to most industrial applications, including those with in-line or right angle reducers, countershafts, chain and sprocket or V-belt drives. Manufacturer says Flexi-Speed Drives are ideal for driving to standard gear reducers for parallel drives or worm gear reducers for inexpensive right angle drives. Details are given in Bulletin V-532. Reeves Pulley Co.

**To receive product data circle item numbers on the handy Reader Service Cards on pages 35-36 and 169-170.**

## 18—ELECTRONIC "PACKAGES" for controlling, recording

Two new "packages" built around basic components of company's all-electronic Autronic system are announced. A recording package is composed of the Type P2T pressure primary element transmitter, the Type A2R recorder and a constant voltage transformer. A controlling and recording package includes these items as well as a Type A3C controller with proportional band and automatic reset, manual control, and power relay. Continuously adjustable ranges and spans of the equipment are: 0-40 to 0-200 psi; 0-200 to 0-1000 psi; and 0-1000 to 0-5000 psi. The ranges are adjustable to a 50 per cent zero suppression of the actual span setting.

Manufacturer claims several advantages for these systems—instantaneous and accurate response, unrestricted location of the various units, adaptability to many process requirements, and interchangeability of components without recalibration. Initial cost is said to be low and maintenance simple. Full engineering details and specifications are offered. The Swartwout Co.

## 19—CONTROL VALVE is an automatic-manual unit

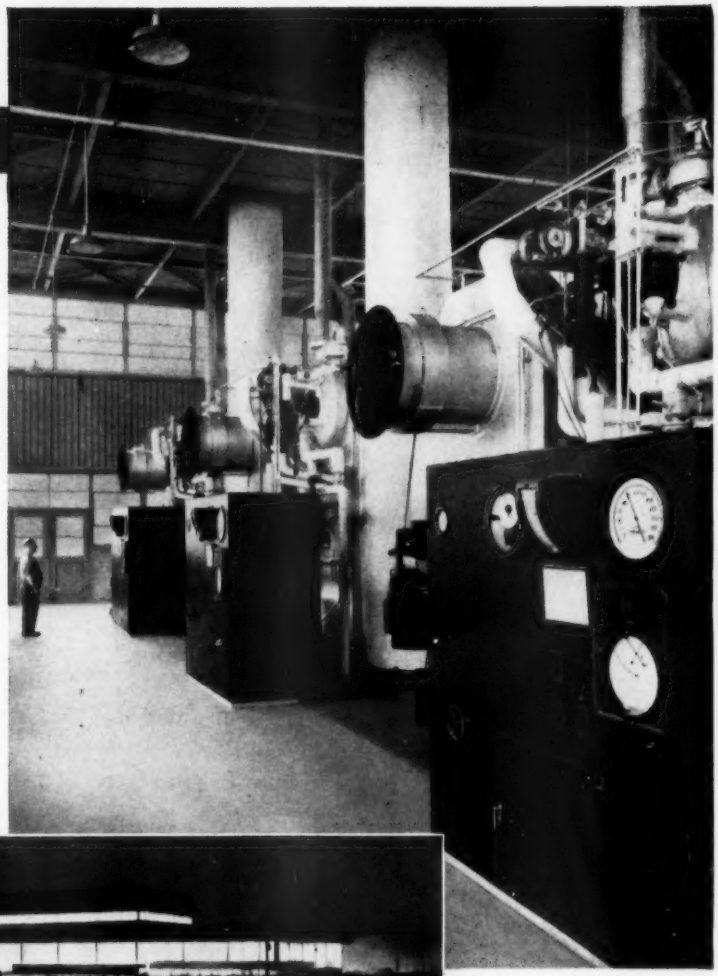
Models 1520 SMW and 1560 SMW Valves offer the advantages of manufacturer's Domotor control unit plus handwheel operation. A major application of the auxiliary manual control is in adjusting the flow of steam to turbines or steam engines, of fuel to engines, and also in intermittent batch processing. Some operators use the manual control when adjusting fuel consumption for arriving at maximum engine efficiency, company points out, adding that the handwheel may also be

*keeping steam cheap . . .*

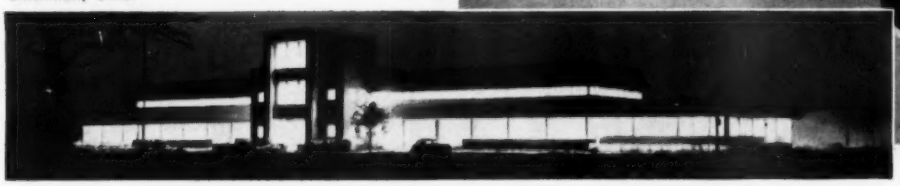
# with a multiple-unit installation

*at*

**WHITE LABORATORIES, INC.**



Night view of new White Laboratories plant—
A. M. Kinney, Inc., Consulting Engineers,
Cincinnati, Ohio.



- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Installation of 3 B&W Integral-Furnace Boilers, Type FM, to serve the steam requirements of the large, modern plant of White Laboratories, Inc. at Kenilworth, N. J., is one more indication of the industry-wide acceptance trend now firmly established by these shop-assembled, B&W Units. Choice of this multiple-unit application of FM boilers instead of a single, larger unit, was decided on after careful consideration of all the factors involved in designing this new, expanded plant to provide a solution to White's continuing space problem. Each of these compact, versatile B&W Units is oil-fired by a B&W Y-Jet oil burner equipped with steam atomizer, and each is capable of producing 23,800 lb of steam per hr at pressures to 235 psi.

Combining the benefits of "package" steam with cost-saving big boiler advantages, B&W's Integral-Furnace Boiler, Type FM, has already been selected for a variety of companies covering more than 50 different industries as well as utilities and other users. B&W Units having a total steam capacity of more than 6½ million lb per hr are now in service or on order. Over half of this total capacity consists of multiple-unit installations. Available in standard sizes for loads ranging between 2900 and 28,000 lb per hr at steam pressures between 15 and 235 psi, this self-contained B&W steam generator is also obtainable for operation at higher pressures.

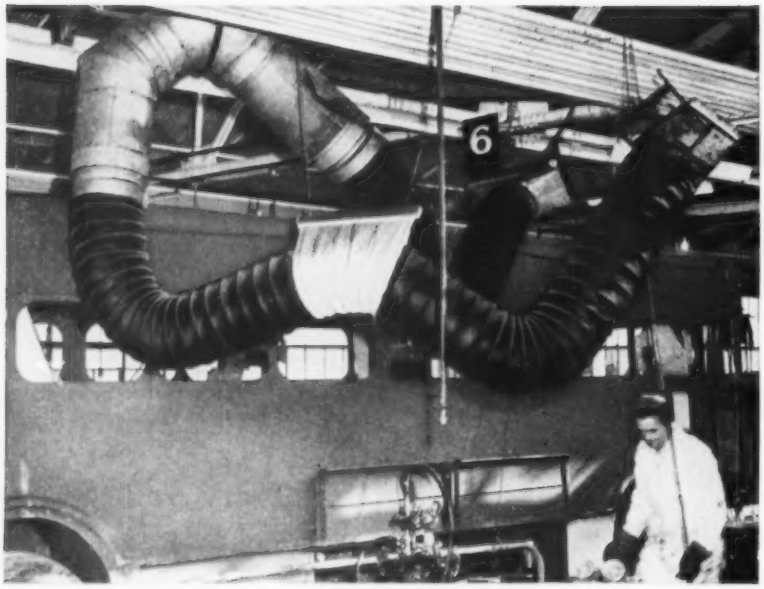
*Send for Bulletin G-76 describing and illustrating the many cost-saving features of this popular boiler. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.*

**BABCOCK & WILCOX**

G-594

**For more facts circle 569 on Reply Card**

# IF YOUR DUCTING SYSTEM HAS "THE BENDS" call in the top specialist— SPIRATUBE®



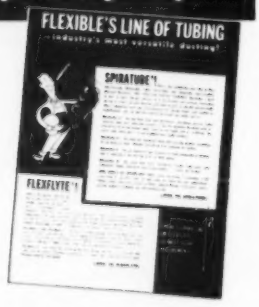
Look at the bulky, unadaptable and costly rigid ducting to which versatile SPIRATUBE has been attached in the above application. If your dust and fume removal... air handling of any kind... requires ducting that will take 'the bends' anywhere and often, ducting that can follow work around, you should know about inexpensive SPIRATUBE. It's easily, quickly installed... offers MINIMUM WEIGHT — MAXIMUM FLEXIBILITY.

Standard sizes with various fabrics and coatings for all requirements are immediately available from well-stocked distributors — coast-to-coast!

Write today for full details on Flexible's amazing cost-saving ducting!

Flexible Tubing CORPORATION

Guilford, Connecticut Pasadena 1, California




For more facts circle 570 on Reply Card


# NEW PRODUCTS

(Begins on page 122)

used as an adjustable limit stop for the automatic control valve plug.

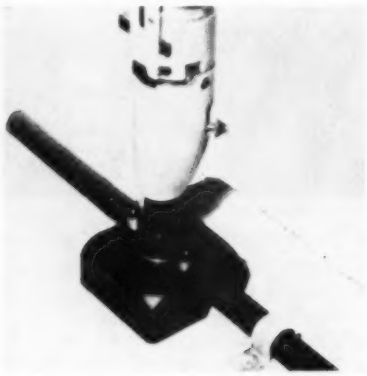
Standard series valves are designed to withstand operating pressures to 5000 psi, effective temperature ranges from –100 to 450 F. The Annin Co.

## 20—SPECIAL GUARDS for powder actuated stud driver

A line of special purpose guards is announced for this company's Model 450 Stud Driver. Designed for instant anchoring of special sections or fixtures to steel or concrete, the guards conform to the shape of the prefabricated sections, to give maximum coverage of the work area and easy tool and fixture positioning. Each guard can be rotated a full 360 deg, so driver is always in a comfortable operating position.

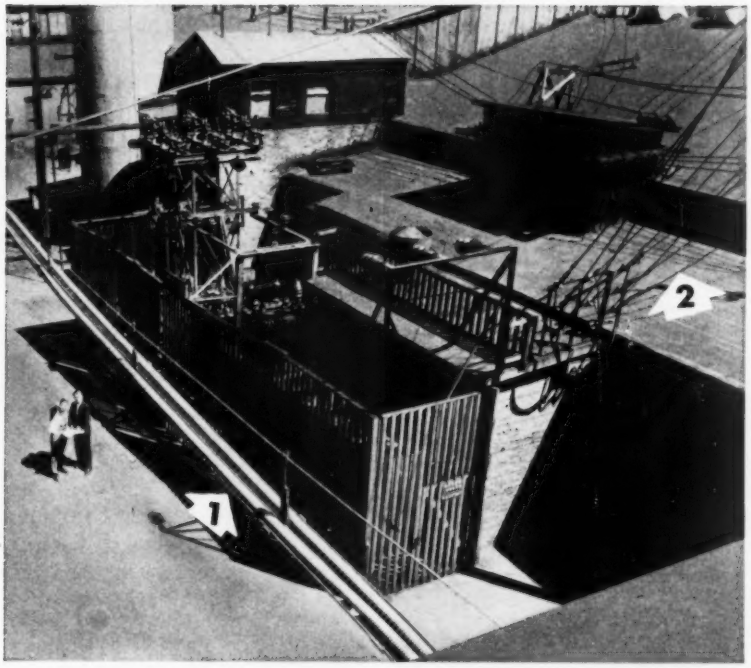
The new line includes guards for fastening conduit clips, structural angle and channel, Unistrut and Wiremold sections, Loxit channel, plywood carpet gripper, electrical switch, utility and outlet boxes and lathing channel. Custom guards may also be supplied and all guards are interchangeable with the driver's standard guard furnished.

According to manufacturer, the conduit clip guard (pictured) is particularly versatile, being readily adjustable for use with ½-, ¾- and 1-in. conduit, both light wall and rigid types. The clips are snapped into the guard, the driver positioned over the conduit or pipe and a stud driven through the clip directly into concrete or steel base material. Remington Arms Co., Inc.



## 21—GENERAL PURPOSE RELAY offers longer service life

According to company engineers, the operating life of the new CR2790-E Relays has been greatly extended by the use of a braided shunt and repositioning of the shunt to reduce tension and wear. Use of the standardized open-form relays with conversion kits, which may be stocked separately, provides the units with greater utility and permits reduction in inventory, it is pointed out. Conversion units are available for metal and compound base back-mount-




# Kaiser-Frazer Cut Installation Costs

## Using G-E V-c INTERLOCKED ARMOR CABLE SYSTEM

Kaiser-Frazer Company greatly reduced conductor-installation costs when they modernized a recently-acquired parts plant in Dowagiac, Michigan. They were able to make these savings by using G-E V-c interlocked armor cable to feed 4.16 kv into five load centers for a radial distribution system.

The two armored cables (1) in the picture above are replacing the two dozen low-voltage cables (2) at the right. This picture illustrates the compactness and neatness of the easily-installed G-E V-c interlocked armor cable system on the left as compared to the open wiring shown on the right.

G-E No. 1799 varnished-cambric-insulated interlocked armor cable is light and flexible — long lengths can easily be pulled into position, bent around corners and projections, quickly spliced with simple mechanical joints. The G-E interlocked armor cable installed in racks is always accessible for inspection or system adjustments. For more information, write Section W85-664, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

*You can put your confidence in—*

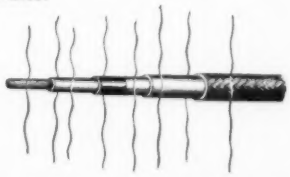
**GENERAL ELECTRIC**

## WIRE AND CABLE IDEAS for Plant Engineers

**Cable Application Booklet:** Tells how to select, splice, and terminate G-E Versatol* Geoprene 600-volt cable—the all-purpose, rubber-type cable for dependable wiring. Write for your free copy.

**New BX* Armored Cable is lighter and stronger:** By utilizing glass braid, impervious to rot and flame, G-E has developed a new, smaller-diameter BX cable that carries U. L. listing. It is lighter, stronger, and easier to pull through drill holes than ever before.

**Heavy-duty Portable Cords:** Designed for heavy-duty portable electric equipment, in garages, factories, and wherever severe service conditions are encountered. G-E Type S rubber-jacketed cords are tough, flexible, durable, and resistant to most acids, alkalies, and water.



**For high-temperature wiring—G-E Deltabeston*:** Let your G-E Construction Materials distributor help you select the right Deltabeston wire or cable for protection against moisture, oil, corrosive vapors, or abrasion — as well as for average or extreme heat conditions.

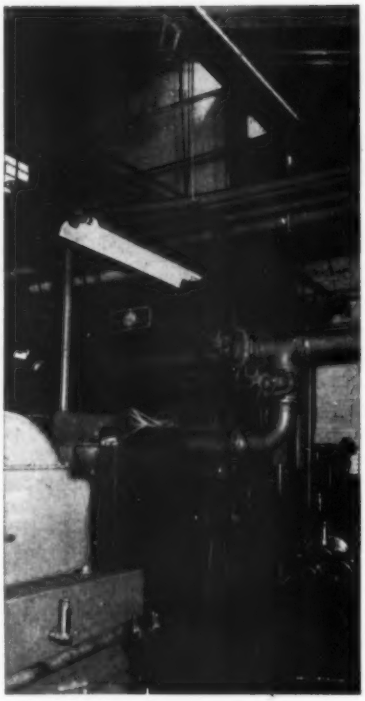
For more facts circle 571 on Reply Card

# You Get Trustworthy Liquid or Gas Cooling With Great Cooling Water Savings from the NIAGARA AERO HEAT EXCHANGER

● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.



Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96.

**NIAGARA BLOWER COMPANY**

Over 35 Years Service in Industrial Air Engineering

Dept. PE, 405 Lexington Ave. New York 17, N. Y.

*Experienced District Engineers in Principal Cities of United States and Canada*

**For more facts circle 572 on Reply Card**


## NEW PRODUCTS

(Begins on page 122)

ing, base receptacle and relay jack-plug applications, and explosion proof enclosures for dust tight and Class I, Group D service.

These relays are rated from 6 to 300 v; 60, 50 and 25 cycles, plus d-c; and 10 amp continuous contact rating. Contact arrangements include double-pole single-throw, double-pole double-throw, and single-throw double-break. The new relays are suggested for use as starters for small a-c motors having sufficient overload protection, and for use in electronic equipment and air conditioners where small space and long relay life are factors. Bulletin GEC-257C gives full data. General Electric Co.

### 22—WHEEL PIPE CUTTERS for speed and easy handling

Coated with a tough, oven-dried lacquer finish, the wheel cutters in this redesigned line come in two sizes . . . No. 2 for ⅛- to 2-in. pipe, and No. 4 for 2- to 4-in. pipe. Described as rugged but light, the cutters have been engineered for added working comfort, balance and speed. Changes in design permit power to be applied directly to the cutter wheel which, being close to the slide track of the guide block, reduces slide block wobble. Thus, it is explained, there is no wasted pressure, and a finer degree of accuracy is afforded. Beaver Pipe Tools, Inc.

### 23—FLOOR MACHINE is small sized and economy priced

The Special 12 has many features of the larger heavy-duty floor machines; it can be used for waxing, scrubbing, shampooing rugs, sanding or buffing. Being only 11 in. high, it is convenient for use under fixed furniture and in confined quarters. A ¼ hp motor turns a 90-sq in. brush at 185 rpm under load. Finger springs on the brush brackets are provided to keep the machine riding level.

Among "extras" incorporated in the Special 12 is an adjustable handle which can be set to a convenient operating height, and can be raised upright for storage in a small space. Safety features include a fingertip-controlled contact trigger switch and a wire whisker in the brush to guard against static sparks. The machine can be bought for $180 including polishing brush. Other attachments are available at additional cost. Maintenance Wax Dept., S. C. Johnson & Son, Inc.

### 24—OIL ACTUATED CLUTCH is for general industrial use

Available in the Model MOS (single) and MOD (duplex) the new Oil Actuated Multiple Plate Clutch is designed to provide such features as no-adjustment, higher, more constant torque capacity, more compactness, adaptabil-

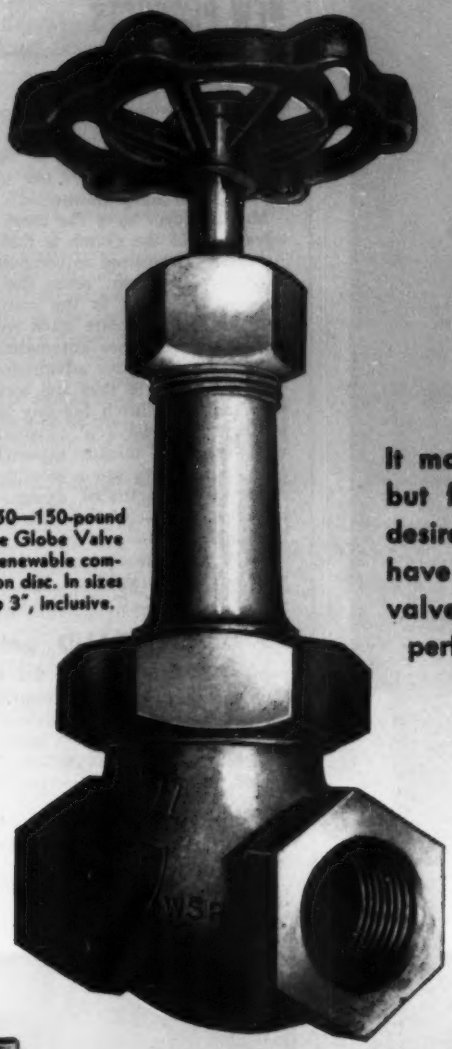


Fig. 150—150-pound Bronze Globe Valve with renewable composition disc. In sizes ⅛" to 3", inclusive.

# If you want freedom from worry, install POWELL VALVES

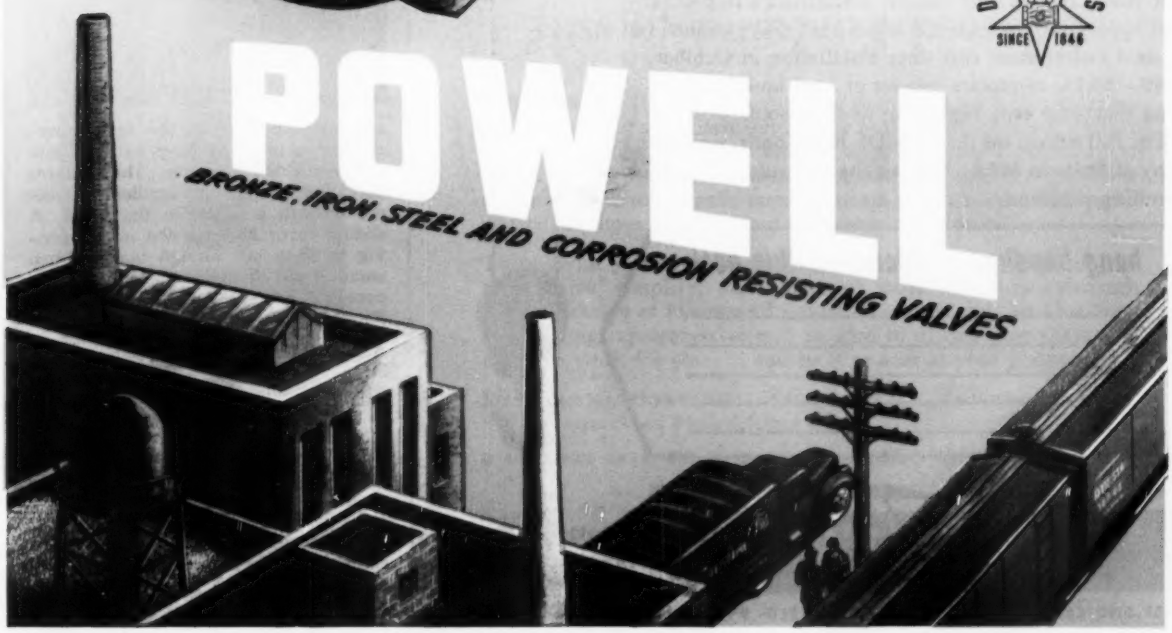
**It may not be one of the "Four Freedoms" but freedom from worry is greatly to be desired. In flow control equipment you can have this freedom with Powell Valves—the valves with a record for long, dependable performance with minimum maintenance.**

**The Wm. Powell Company**
**Cincinnati 22, Ohio**

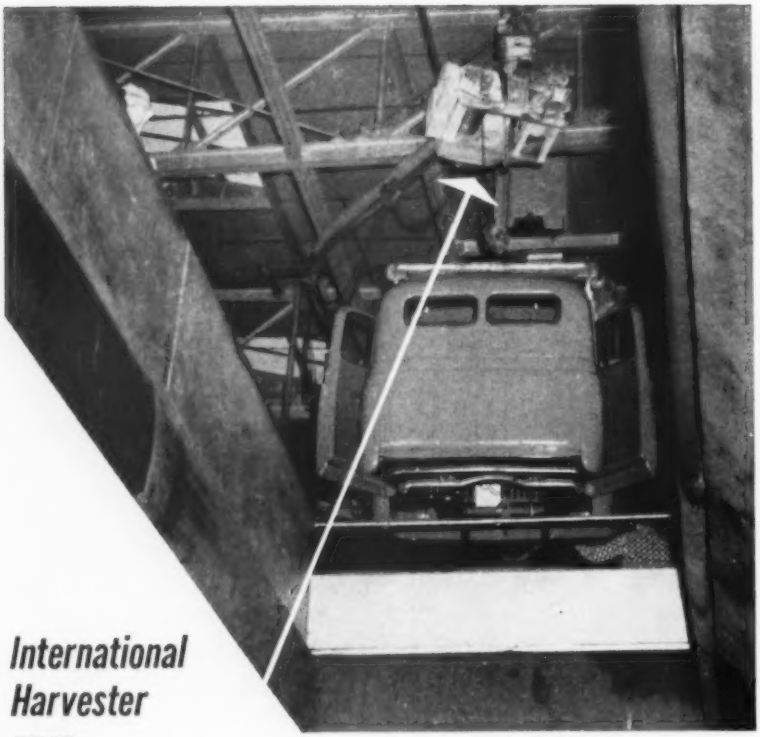
DEPENDABLE VALVES SINCE 1846

# POWELL

BRONZE, IRON, STEEL AND CORROSION RESISTING VALVES



For more facts circle 573 on Reply Card



*International Harvester says:*

# *THESE HOISTS MUST NOT FAIL*

At the Springfield, Ohio, truck plant of International Harvester Company, two Robbins & Myers 2,000 lb. capacity, two-speed, powered trolley, model F-3MDS electric hoists lower truck cabs to the chassis assembly line on the first floor. They operate at top speed, on a rigidly maintained schedule, eight hours a day. They *can't* be permitted to fail because they are at key points in final assembly. The hoists receive only routine maintenance inspection, and apparently they are the hoists that *really* cannot fail —total maintenance cost since installation in October, 1949—$4.15, to replace one set of load brake friction discs that were only beginning to show some wear!

For full details on the F-3MDS R&M hoist, write for a copy of Bulletin 805A. And for the best solution to your handling problems,

*hang handling problems on this hook*

name _____

position _____

company _____

address _____

_____

TAKE IT UP WITH

ROBBINS & MYERS INC

MOTORS HOISTS CRANES FANS MOYNO PUMPS

HOIST AND CRANE DIVISION, SPRINGFIELD 99, OHIO

For more facts circle 574 on Reply Card


# NEW PRODUCTS

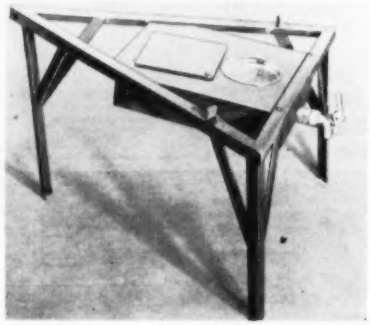
(Begins on page 122)

ity to remote control and longer wear life. Its design is simple, incorporating an integral oil cylinder to clamp the plate stack. Snap rings are used extensively for easy disassembly.

Manufacturer says the most obvious advantage of the clutch is that no adjustment is required to compensate for friction plate wear, since the floating or pressure plate is the ram of the cylinder. As the plate stack wears, the ram travel increases automatically. An important correlative advantage of this design feature is that the torque capacity of the clutch for any given oil pressure is always a constant. And, with constant torque capacity, it is often possible to use a smaller clutch. Also, the oil-actuated design permits the torque capacity to be directly proportional to the applied oil pressure, since this pressure creates the clamping force. Installation data on this clutch is offered. Twin Disc Clutch Co.

## 25—DRAIN STAND gets the last drop from oil drums

This triangular oil drum stand was developed to recover the several quarts of oil or other fluid which usually can't be pumped out of standard 55-gal drums. The drum is inverted over the



screened opening of the stand, permitting as much as 10 qt to drain into the removable reservoir. The contents may then be fed into smaller containers through a faucet in the stand. A sliding cover fits over the mesh opening to keep out foreign matter when stand is not in use. Lugs on the support rails hold the drum in place. West Bend Equipment Corp.

## 26—VOLT-AMP TESTER is a junior snap-around unit

The Amprobe Junior is designed to do a specific job at low cost; its selling price is announced as $19.85. According to manufacturer, this inexpensive pocket tester does a complete testing job; as a snap-around ammeter it measures current instantly without shutdowns or ammeter connections, and as a voltage meter it gives voltage readings on a full-size 1.8 in. calibrated scale, combining ruggedness of a tester

## Pressure controller cuts in steam pump when electric power fails

The diagram at right shows how the Honeywell Pressure Controller is applied in a typical installation, for automatically changing over from electric to steam operation on a pumping unit. The two pumps are connected to the same suction and discharge lines, with check valves in each outlet pipe.

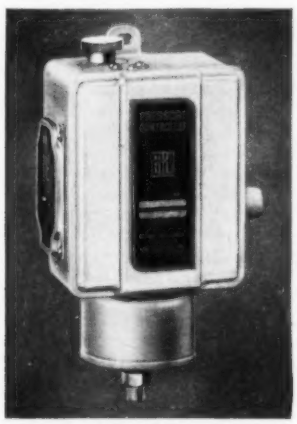
Under ordinary circumstances, the electric-powered pump carries the whole load, while the steam pump stands idle. Connected to the outlet line of the electric pump is a Honeywell P097A Pressure Controller. This controller regulates air pressure to a diaphragm-motor valve in the steam supply line for the standby pump. As long as pressure stays above a preset minimum, the steam valve remains closed.

If power should fail, pressure begins to drop. The instant it reaches the controller's setting—a little above the normal suction pressure—the controller opens the diaphragm valve. The steam pump takes over the pumping job so quickly that there's no appreciable interruption of flow.

Then, when electric power is restored, the controller automatically shuts down the steam pump as soon as pressure rises on the discharge side of the electric pump.

Note that the check valve prevents the pressure controller from being affected by the output of the steam-driven pump. Proper adjustment of the control setting eliminates false action due to temporary drops in pressure.

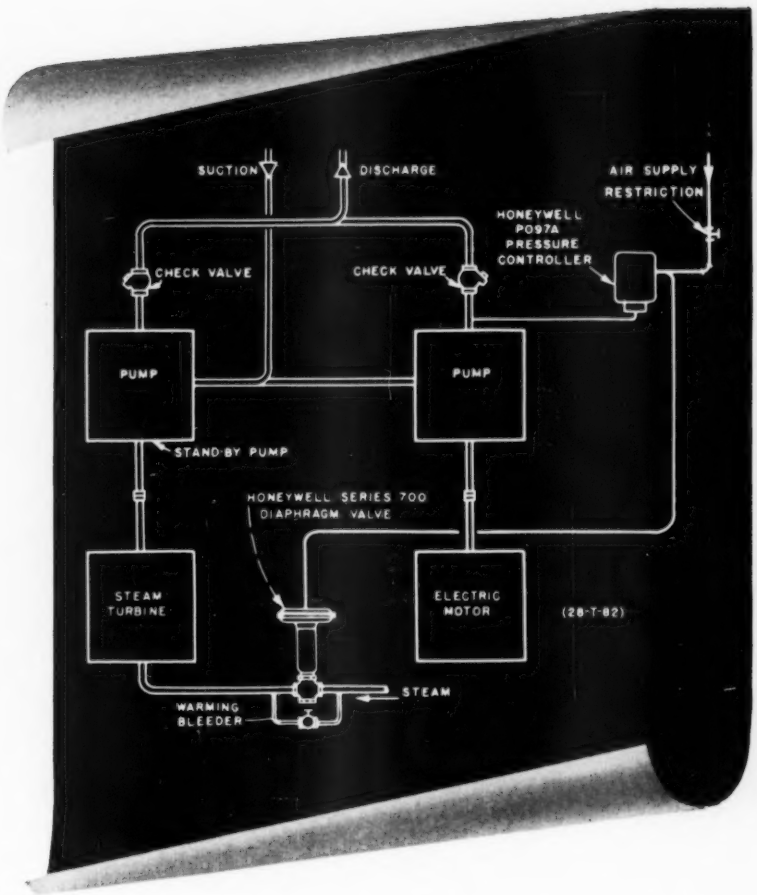
The more than 7000 Honeywell control devices offer unlimited uses for regulating temperature, pressure, liquid level, vacuum and humidity. All are built for the utmost in dependability . . . and they're backed by Honeywell's nationwide service organization.



*Honeywell P097A Pressure Controller*

### WOULD YOU LIKE TO RECEIVE "Industrial Control News"?

You'll find a wealth of ideas on how to use automatic controls in *Industrial Control News*. If you're not already receiving this informative magazine, just send your name, company, title and address to MINNEAPOLIS HONEYWELL REGULATOR CO., *Industrial Division*, Station 213, 4491 Wayne Ave., Philadelphia 44, Pa.




# Honeywell controller prevents loss of pumping pressure

When electrically driven pumps are paralleled with steam-driven standby pumps, automatic switchover in the event of power failure poses a problem. A Honeywell pressure controller, connected as shown above, provides an economical and thoroughly dependable solution . . . automatically cuts the steam pump into service when needed, without interrupting the pumping pressure.

Throughout your own plant, too, there are endless opportunities to improve, simplify, make safer or more automatic—through the application of Honeywell industrial control devices. Our local engineering representative will be glad to discuss how these controls can work for you . . . and he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4491 Wayne Ave., Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for your copy of Catalog 8304, "Industrial Controls."

MINNEAPOLIS **Honeywell**

*First in Controls*

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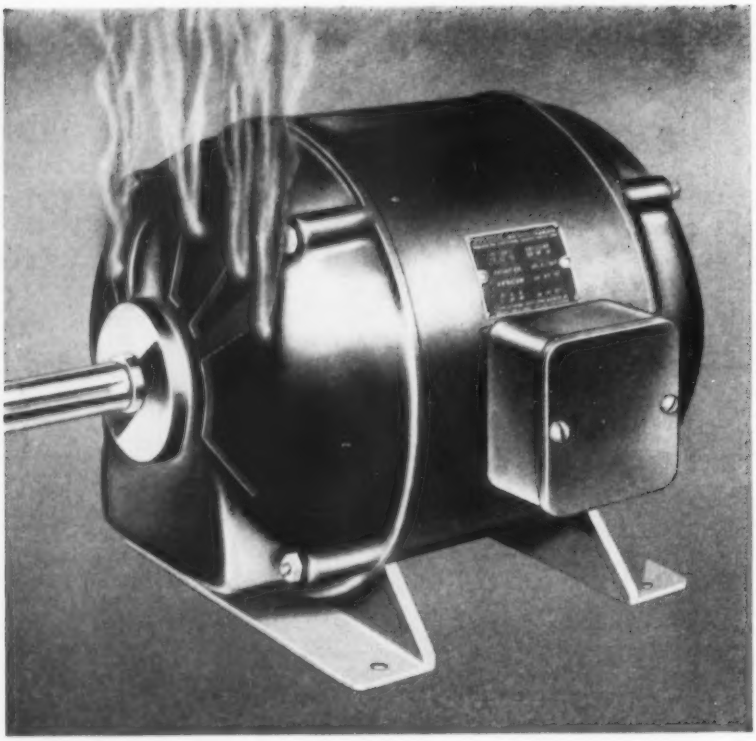


## You can avoid motor burnouts

THE temperature surrounding motor protection equipment is an important factor in motor burnouts. In order to prevent nuisance stoppages in hot weather, the rating of protective equipment is often raised. Then, when plant temperature drops, protection is inadequate . . . motors are more subject to burnout.

This explains why an ever-increasing number of plants are standardizing on HEINEMANN Circuit Breakers as manual motor controllers. Set tripping points of HEINEMANN Circuit Breakers *are completely independent of ambient temperature.* Moreover, HEINEMANN Circuit Breakers provide inverse time delay to permit starting inrush or harmless, temporary overloads . . . yet they provide the fastest circuit interruption available on large overloads, stalled rotors, single-phasing or short circuits.

HEINEMANN Circuit Breakers operate on a hydraulic-magnetic principle. They do not employ thermal elements or heaters. They are available with precise ratings to the motor, and are provided with time delay characteristics especially suited to trouble-free motor protection.

***don't use heat ...USE POWER***

*Send for Bulletin 1410.*

**HEINEMANN ELECTRIC CO.**

**128 PLUM STREET • TRENTON 2, NEW JERSEY**

**For more facts circle 576 on Reply Card**

# NEW PRODUCTS

(Begins on page 122)

with accuracy of an instrument. Accuracy for both amperage and voltage is given as ±3 per cent of full scale.

To measure current without ammeter connections, you snap the trigger-operated jaws around one conductor (insulated or uninsulated) and you have a reading. To measure voltage, plug the test leads into instrument and clip to load. Several ranges are available to suit different jobs. The Model 10 has a range of 0 to 10 amp a-c; Model 25, 0 to 25 amp a-c; Model 50, 0 to 50 amp a-c; and Model 100, 0 to 100 amp a-c. All models have voltage ranges of 0 to 125/250 v a-c.

The special significance attributed to the Amprobe Junior is that with it practically everyone who works with electricity can have a snap-around tester, including those who require only a single ammeter range, or more accuracy than a voltage tester can provide. Pyramid Instrument Corp.

**It's easy to obtain product data with the postage-free Reader Service Cards on pages 35-36 and 169-170. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.**

### 27—DUCT LINER provides thermal, acoustical insulation

A new Fiberglas insulating product for lining the interior of air conditioning or warm air ducts, the Flexible Duct Liner is said to have high efficiency in reducing the sounds that normally travel through air ducts. It also has excellent thermal insulating properties, manufacturer states, and when used inside of ducts, lets the metal surface act as a vapor barrier to prevent condensation on ducts carrying cool air through areas of high humidity.

Because of its flexibility this liner may be installed on metal sheets before they are bent to form ducts. It is cut to the size of the unformed sheets and adhered to them; then sheets are formed in a sheet metal brake to produce a complete duct with liner already installed. Company adds that the insulation is sprayed with a light coating of fire-safe Neoprene to prevent erosion by high velocity air and to prevent frictional losses. Owens-Corning Fiberglas Corp.

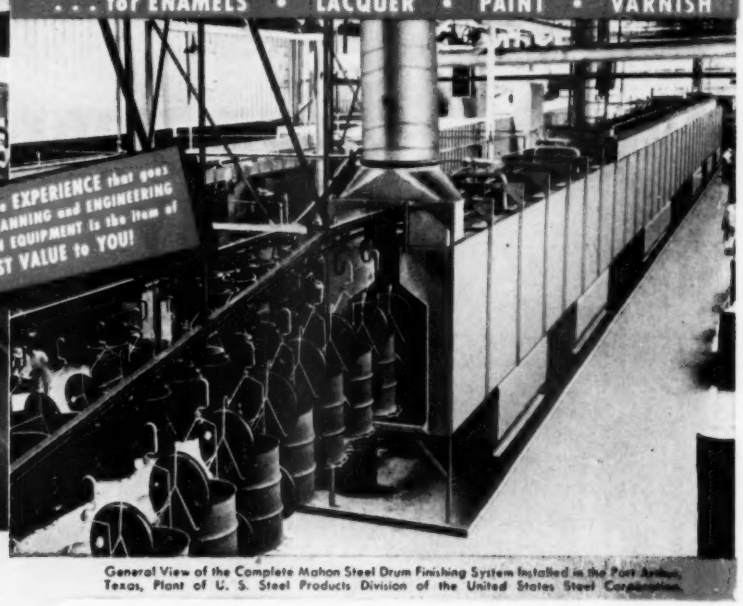
### 28—GAGES for liquid level, tank filling applications

Glo-Rod Gages are described as particularly useful for colorless liquids and daylight sight readings, giving instantaneous checks with no light loss through reflections. Company says nor-

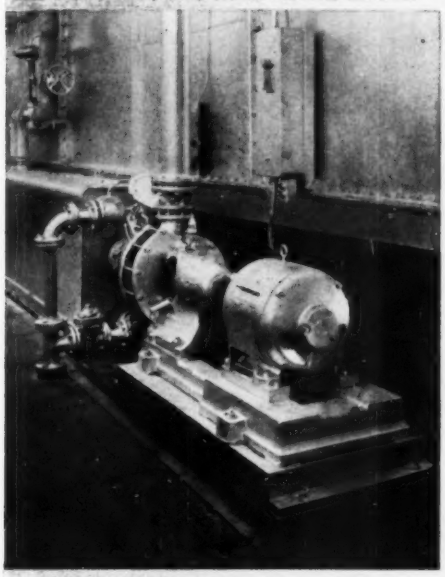
# COMPLETE *Finishing* SYSTEMS

**. . . for ENAMELS • LACQUER • PAINT • VARNISH**

Complete Mahon Steel Drum Finishing System installed in the U. S. Steel Products Plant at Dolton, Ill. Similar Mahon Installations, including Metal Cleaning, Rust Proofing and Drying Equipment, are also installed in U. S. Steel Products plants at Sharon, Pennsylvania, and at Alameda, California.




General View of the Complete Mahon Steel Drum Finishing System Installed in the Port Arthur, Texas, Plant of U. S. Steel Products Division of the United States Steel Corporation.



One of the large Acid Recirculating Pumps employed in the Pickling and Descaling Stage of the Mahon Equipment illustrated above. Corrosive resistant material is employed for Pumps, all Piping, Solution Tanks, Processing Tunnel Housing and other parts exposed to corrosive materials.

## *Chemically Clean, Scale-Free, Rust Inhibited U. S. Steel Drums Get their Fine Finish in Mahon Equipment!*

In four of its strategically located steel drum plants, The U. S. Steel Products Division of the United States Steel Corporation depends on Mahon Finishing Systems to produce its high quality, 100% scale-free, rust-inhibited steel drums. These drums are absolutely clean, and are protected with a finish which has been processed for maximum adherence and endurance. In the prepainting metal treatment the drum shells and end plates pass through a nine-stage Mahon Cleaning, Pickling and Phosphating Machine—the last stage of which is a chromic acid rinse. These machines are designed with conveyors outside the processing tunnel to protect chain, trolleys and track from the corrosive action of sulfuric acid. Conveyor adapters of noncorrosive material pass through a Patented Mahon Hydro-Hermetic Seal which effectively seals the top of the processing tunnel throughout its entire length. If you are contemplating new finishing equipment, you too, will find Mahon engineers better qualified to determine your equipment requirements and to do the all-important planning and engineering to insure specific results. Regardless of what your product may be, Mahon planned and Mahon built equipment will prove more economical over a period of time. See Sweet's Plant Engineering File for information, or write for Catalog A-653.

**THE R. C. MAHON COMPANY**

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens, Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

# MAHON

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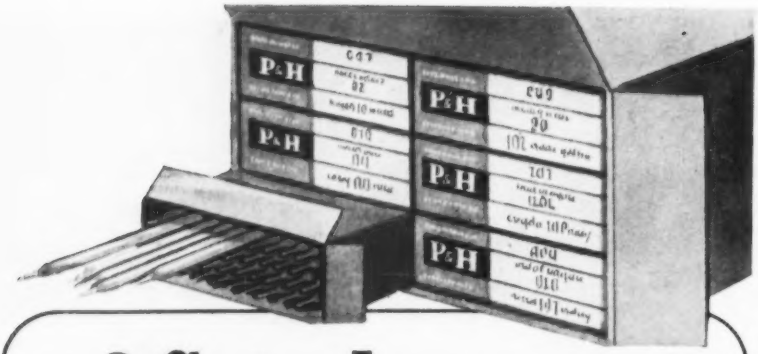


# Cuts down your inventory

## of seldom-used electrodes

**P&H**

**Maintenance Pack**

Small-package assortment of electrodes for repair and maintenance welding

You don't have to buy seldom-used electrodes in quantities larger than you need. With the P&H Maintenance Pack, you can keep some of each type on hand—economically. This assortment includes seven different electrodes packaged to stay dry — and clearly labeled to make selection easy. You're equipped to do all kinds of repair and maintenance jobs—get fast, easy, sound welds.

Let the P&H Maintenance Pack save you time, trouble, money. Order from your P&H representative or local distributor.

### *7 different electrodes*

**(Approximately 27 lbs.)**

- ★ **AC-3, 1/8", 5/32", 3/16"** — For all position welding of mild steels and sheet metal. AC or DC.
- ★ **AC-1, 5/32"** — For mild steels. AC or DC.
- ★ **70LA2, 5/32"** — For high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
- ★ **Harstain, 1/8"** — For spring steels and stainless steels of all kinds. AC or DC.
- ★ **Nicast "55", 1/8"** — For machinable welds on cast iron. Nicast welds are strong and non-porous.

**$13.90** complete assortment

P&H WELDING DIVISION
**HARNISCHFEGER CORPORATION**
4577 West National Ave., Milwaukee 46, Wis.

*the P&H Line*

2588

**For more facts circle 578 on Reply Card**

# NEW PRODUCTS

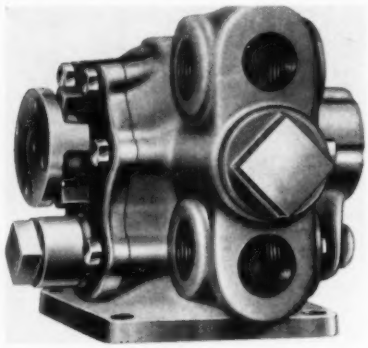
(Begins on page 122)

mal illumination is sufficient to transmit light upward through the plastic rod causing the liquid to appear as dots below the surface of the liquid and ash dashes above the liquid. The gage can be illuminated by flashlight in darkened areas, or a compact electric unit can be furnished where permanent lighting is required. Where the gage is to be used in restricted space, models are available with the reading face offset.

Glo-Rod Gages require no separate mounting brackets when attached directly to tank walls; an automatic cut-off valve is available to eliminate large fluid losses where piping is necessary between tank and gage. These gages come in a variety of sizes and models, are suitable for all sizes and shape tanks, and reported particularly successful on diesel fuel and water tanks. Nathan Mfg. Corp.

## 29—FOUR-WAY VALVE positions hydraulic cylinders

The Type 555-RO Four-Way Hydraulic Valve is designed to provide a simple, inexpensive and reliable self-contained valve mechanism to position double-acting hydraulic cylinders or hydraulic motors. Suggested applications include hydraulic lifts, many types of machinery, and power tools. According to company this valve is not a new development, since it has been made for



certain users for many years, but it is just now being made available to industry generally.

The valve may be used to operate one, two or three hydraulic cylinders. Operating fluid is No. 10 SAE motor oil or hydraulic oil of equal viscosity. Design pressure is given as 300 to 1500 psi (not suitable for over 1600 psi), and capacity as approximately 400 gpm at 1500 psi. Full data and illustrated operating details are provided in Bulletin S-600. A. W. Cash Co.

## 30—DIESEL ENGINE designed for heavy-duty service

Although designed for heavy-duty applications, the new Model 38F5¼, an opposed-piston diesel, is but a fraction of the size and weight of many heavy-

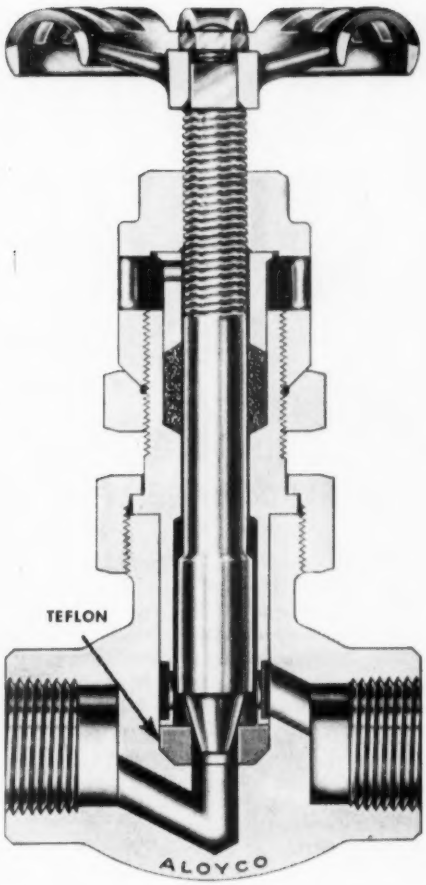
# ALOYCO
## "TEFLON"-seated valves give Longer Operating Efficiency

The critical problem of leakage in small valves used for metering, instrument lines, and sampling of corrosives has been solved by the new ALOYCO design features shown here: renewable Teflon seats and exterior threading completely out of the fluid zone.

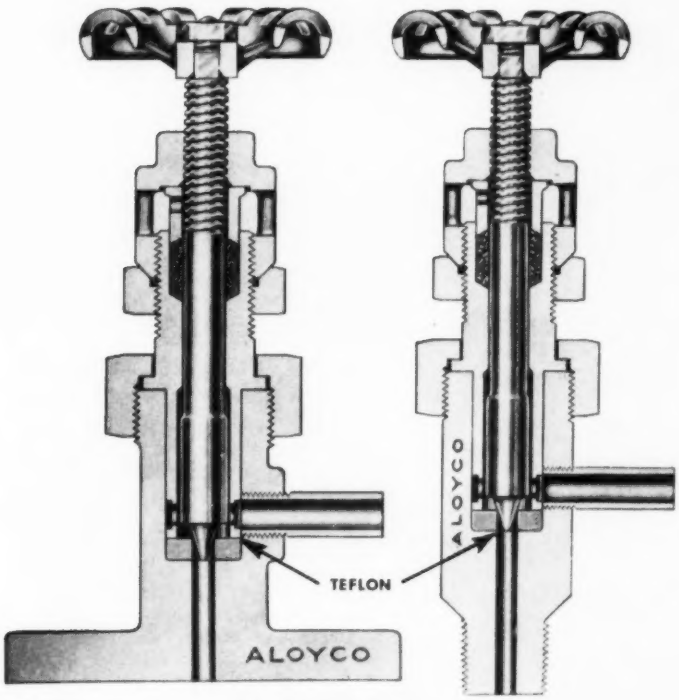
Teflon is a new material with exceptional properties of toughness, heat resistance and corrosion resistance. It withstands the attack of practically all chemicals at temperatures up to 500° F, and has given leak-free performance for over four years of continuous service in valves handling hot sulphuric acid.

Teflon packing is available in all ALOYCO valves. Teflon renewable seats are available in small valves such as those illustrated and in larger size globe, angle, Y, and check valves. Address your specific corrosion problems to the *Aloyco Corrosion Engineering Service*. Our long and specialized experience in this field is at your service.

39




**No. 62 Needle Valve,** 3000 lb. working pressure, made in sizes ¼ inch through 1 inch. Available in 18-8S (type-304), 18-8SMo (type-316) and Aloyco 20.




**SAMPLING VALVES**

No. 731—flanged end
150 pound service

No. 732—screwed end
300 pound service

**ALLOY STEEL PRODUCTS COMPANY, INC.**

1308 West Elizabeth Avenue, Linden, New Jersey

Plants: Linden, N. J.; Bloomfield, N. J.; Elizabeth, N. J.

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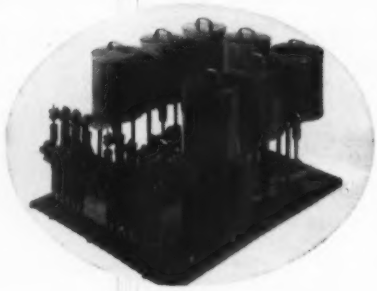
**For more facts circle 579 on Reply Card**

# UTMOST PROTECTION

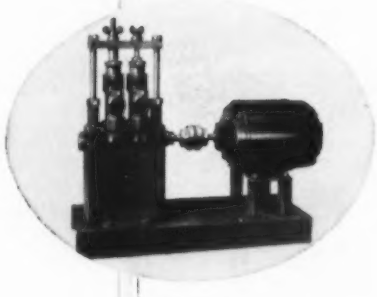
## at lowest cost

**Manzel CHEMICAL FEEDERS and HYPOCHLORINATORS**

To the cost-conscious operators of industrial plants Manzel Feeders pay dividends in accuracy, dependability, and *surprising* economy of purchase and maintenance. Built by an organization famous for fifty years in the manufacture of automatic force feeding equipment, Manzel design is *thoroughly* proven. Whatever your feeding problem, ask Manzel.

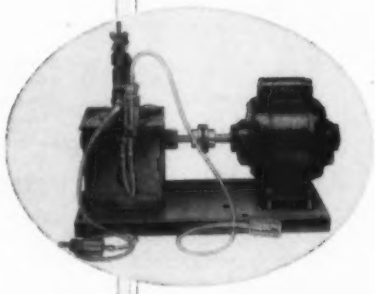


**MULTI-FEED CHEMICAL FEEDERS**
Any number of pumping units can feed the same or different chemicals simultaneously.



**LARGE OR SMALL CAPACITIES**
Various models pump from a fraction of a drop to 60 gph. All types of drives are available.

**MANZEL HYPOCHLORINATORS**
Positive, precise, and *low cost.* Easy to install and service.



***Look at these Quality Features***

- **Full control**... *accurate adjustment from 0 to full feed.*
- **Wide range** *of feed covers nearly every job.*
- **Positive in action**... *no clogging.*
- **Sight Feed** *and solution strainer.*
- **Easily adjusted** *while running.*

Manzel

Babcock Street, Buffalo 15, N. Y.

**For more facts circle 580 on Reply Card**


# NEW PRODUCTS

(Begins on page 122)

duty engines—a 225 hp unit weighing 7100 lb. Manufacturer expects it to fill needs for engines in the 225 to 750 hp range. It has a 5¼-in. bore and 7¼-in. stroke, develops a continuous duty rating of 75 hp per cylinder at 1200 rpm.

Basically this engine is a smaller version of the 8⅛ by 10 in. opposed-piston diesel used as a submarine engine during World War II. Its design is characterized by a pair of pistons in each cylinder, operating in opposite directions so that the piston heads form a common spherical combustion space. The upper pistons, controlling the scavenging air inlet ports, are connected to an upper crankshaft, and the lower pistons, controlling the exhaust ports, are connected to a lower crankshaft. Connected by a certical splined quill shaft, the two crankshafts work together to transmit power to the drive end of the lower crankshaft.

The engines are self-contained units incorporating pumps, heat exchangers, filters, closed cooling water circuit and mechanical injection fuel system. Also built-in is the rotary scavenging air blower. The engine can be equipped for dual-fuel and spark-ignition gas operation. Fairbanks, Morse & Co.

**One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.**

## 31—WATERPROOF TAPE for overseas packaging jobs

Permacel 691 is announced as conforming to government specification JAN-P-127, Type I, Grade B. It is intended primarily as a companion tape to company's Permacel 68, already on the market, but will sell at a much more economical price. Industrial Tape Corp.

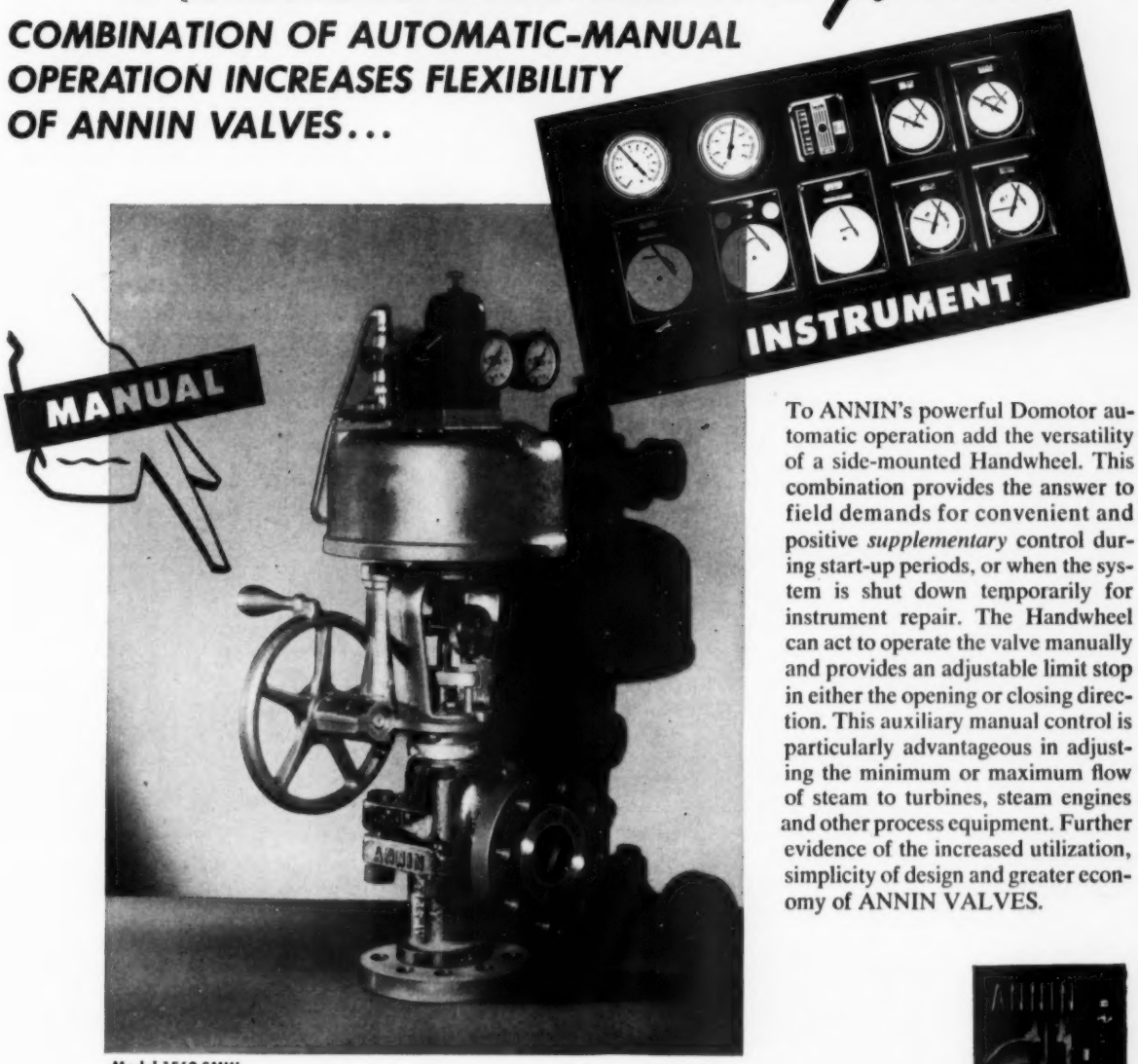
## 32—AIR CLEANER ASSEMBLY for horizontal unit heaters

Consisting of a die-formed filter frame with standard size cleanable type air filters, this new Clean-Core Air Cleaner Assembly is designed for easy installation on manufacturer's horizontal unit heaters, new or existing. The assembly is being built in six sizes for 11 models of company's Type SH Unit Heaters which are used in hot water or steam heating systems.

Installation of this assembly is intended to eliminate cleaning of the heaters, especially if the unit is located in an area where dust, oil mist, or foreign matter is prevalent. The assembly is also suggested for installation in industrial plants where regular cleaning of the unit heaters is im-

# VERSATILITY *plus!*

## COMBINATION OF AUTOMATIC-MANUAL OPERATION INCREASES FLEXIBILITY OF ANNIN VALVES...

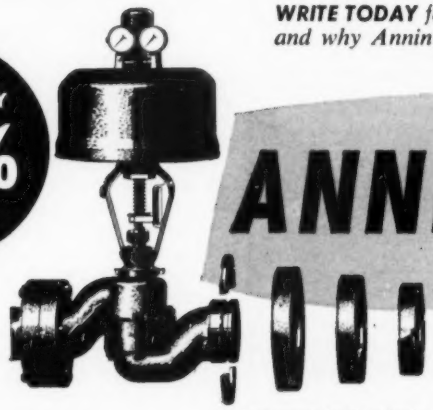



Model 1560 SMW

To ANNIN's powerful Domotor automatic operation add the versatility of a side-mounted Handwheel. This combination provides the answer to field demands for convenient and positive *supplementary* control during start-up periods, or when the system is shut down temporarily for instrument repair. The Handwheel can act to operate the valve manually and provides an adjustable limit stop in either the opening or closing direction. This auxiliary manual control is particularly advantageous in adjusting the minimum or maximum flow of steam to turbines, steam engines and other process equipment. Further evidence of the increased utilization, simplicity of design and greater economy of ANNIN VALVES.

***WRITE TODAY** for illustrated bulletin showing how and why Annin offers the best in control valves.*

CUT INVENTORY **50%** WITH



**ANNIN** *Control* **VALVES**

**THE ANNIN COMPANY** 3500 Union Pacific Avenue
Los Angeles 23, California

**For more facts circle 581 on Reply Card**

# THIS GEM OF A FLOOR PLATE OFFERS FIVE POINTS

### Flawless Foot Safety!

Although all floor plates have raised figures, only one—A.W. SUPER-DIAMOND—has the anti-skid precision pattern you see here. Each diamond is placed perpendicularly to its neighbor. This means that every footstep is across the grain—every step is secure.

### Jeweled Surface Service!

More than forty diamond traction points grip every footstep. Regardless of the angle of approach or the incline of the flooring, A.W. SUPER-DIAMOND holds footsteps fast, offering maximum skid-resistance. Every diamond works against a skid.

### Quality With Savings!

The initial cost of A.W. SUPER-DIAMOND is low—and so is the maintenance. Perfect matching end-to-end and side-by-side in SUPER-DIAMOND permits cutting with a minimum of waste. Cleaning is the only maintenance.

### Tough As A Diamond!

A.W. SUPER-DIAMOND is a steel floor plating that possesses diamond-like hardness and toughness. Years of abuse and hard use won't wear out this rolled floor plate. It withstands hard blows and heavy loads without cracking or breaking—and it's resistant to oil, heat, and fire.

### No Special Cleaning!

Although SUPER-DIAMOND'S exclusive pattern holds footsteps, it doesn't hold dirt. No cracks or joints mean this plating can be cleaned easily with broom, mop, or hose—and it dries fast after washing. If you want, SUPER-DIAMOND can be painted.

*For safety with economy in potential accident spots in your factory, get complete information about* A.W. SUPER-DIAMOND Rolled Steel Floor Plate. Simply clip and mail this coupon, and we'll be glad to send you technical data and suggestion for use.

**A.W. SUPER-DIAMOND**

ROLLED STEEL FLOOR PLATE

**ALAN WOOD STEEL COMPANY**

CONSHOHOCKEN, PENNA.

Please send me Booklet SD-45 on A. W. SUPER-DIAMOND

Name_____

Title_____

Company_____

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Other products: A. W. ALGRIP Abrasive Rolled Steel Floor Plate • Plates • Sheets • Strip (Alloy and Special Grades).

For more facts circle 582 on Reply Card


# NEW PRODUCTS

(Begins on page 122)

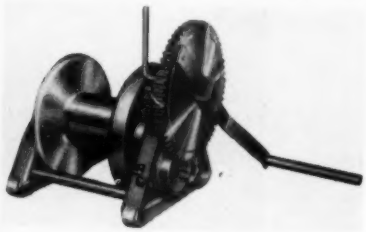
practical because of the proximity of precision machines.

The filter frame is reinforced with steel stampings and the entire unit is electric welded. It is fastened to the top and bottom of the unit heater casing. Company says it takes only a few minutes to install the frame, and only seconds to remove the filters for cleaning. Cleaners with throw-away filters can be furnished for areas where paint spray is present. These cleaners are further described in Bulletin 2552. Young Radiator Co.

## 33—HAND WINCH can be used with electrical power

The Stampco Handiwinch is a mechanical hand-winch with low gear load capacities up to 10,000 lb, designed for optional use with a 1-in. Skildrill or similar power source for electrical operation, permitting the operator to handle loads up to 1000 lb at 10 fpm.

Suggested for jobs where heavy pulling or lifting is required, this handwinch is portable and of all-steel electric weld construction for strength and light weight. It has both high and low gearing for job versatility and



company says the brake design allows for safe accurate load spotting with finger pressure control. The heavy-duty chisel-type spring loaded dog is designed to permit jam-proof operation of the braking device. Load capacity at low gear is 10,000 lb, at 27 to 1 reduction; capacity at high gear is 1900 lb at 4.5 to 1 reduction. St. Anthony Machine Products Co.

## 34—LIGHTING FIXTURE for use in hazardous locations

This new design, one of company's EV Series of explosion-proof industrial lighting fixtures, is declared easier to install and relamp because it is lighter and better sealed. It is also said to have greater lighting efficiency than previous models.

The prime reason announced for designing the new fixture was to improve its threaded connections to prevent liquids, vapors or dirt from entering bulb and receptacle areas. This was accomplished by means of male threadings at three points: near the rim of the hood; where hood and globe-holder are joined together, and where globe retaining ring and cushioning gasket are

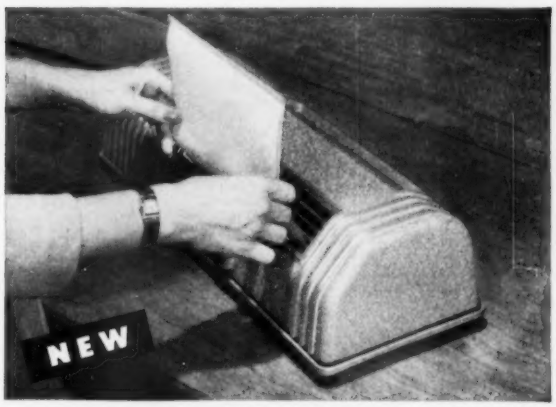
# Remington Rand Methods News

## Mechanize your records handling for cost-cutting plant controls

The same time-and-motion principles apply on your paperwork as on production work. Suppose you pay a posting clerk $2,000 a year. If mechanized methods increase her output by only 30%, you gain a clear $600 per year. Here we illustrate *just a few* of the many Remington Rand machines which can help you cut paperwork costs. Such methods also give you more sensitive and more accurate control of plant operations.

**Brings the visible records TO the clerk.** *Robot-Kardex* already saves clerical time for many firms on inventory control, production control and other operating records. Along with the many advantages of Kardex *visible-control* methods, it also provides the *plus* of push-button, mechanized delivery of the records to comfortable, desk-level position. Delivers any Kardex slide in four seconds average. See booklet **KD-505.**

**Brings the card file right TO the clerk.** *Convé-Filer* is the newest and most efficient method of handling a large, active card file for production control, unit inventory, parts lists, personnel and other operating records. Any card tray is brought automatically to reference position by pedal-switch, freeing both hands for work on the files. Available for 5x3, 6x4, 8x5 and tabulating-card sizes. See booklet **LBV-537.**




**Brings speed to office photo-copying.** *Transcopy* is a brand new *ultra-high-speed* mechanized method for producing exact photographic copies of specifications, correspondence, reports, statistics and other operating records. Transcopy eliminates processing through trays of chemicals, washer and dryer. Negative paper is exposed as usual in Portagraph or other contact printer; then processed with positive paper through the Transcopy machine which handles paper up to 14" wide and any length. The entire procedure, from original copy material to perfect, *ready-to-use* copy print, requires less than a minute. See folder **P-334.**

**Brings a punch TO the punched-card file.** *Card-o-Matic* is a brand-new, labor-saving approach to punched-card billing, inventory control and sales analysis; also for punched-card preparation of orders, shipping labels, parts lists, payrolls, vouchers, etc. Located at the Convé-Filer (or ordinary tub file), this remote-control sensing unit reproduces all desired information from master punched cards. Variable information is entered directly from its keyboard. New detail cards are completed automatically on the Card-o-Matic Punch. For more information, see folder **TM-822.**

**Remington Rand**

**MANAGEMENT CONTROLS REFERENCE LIBRARY**
**Room 2821, 315 Fourth Avenue, New York 10, N.Y.**

Please circle the numbers below for literature desired:

**LBV-537** **TM-822** **KD-505** **P-334**

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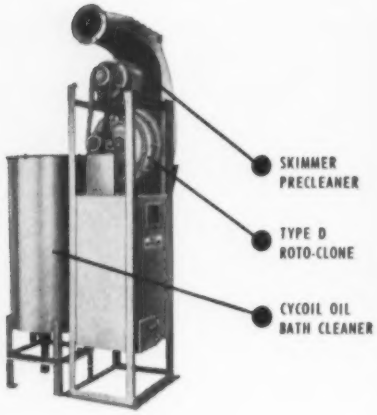
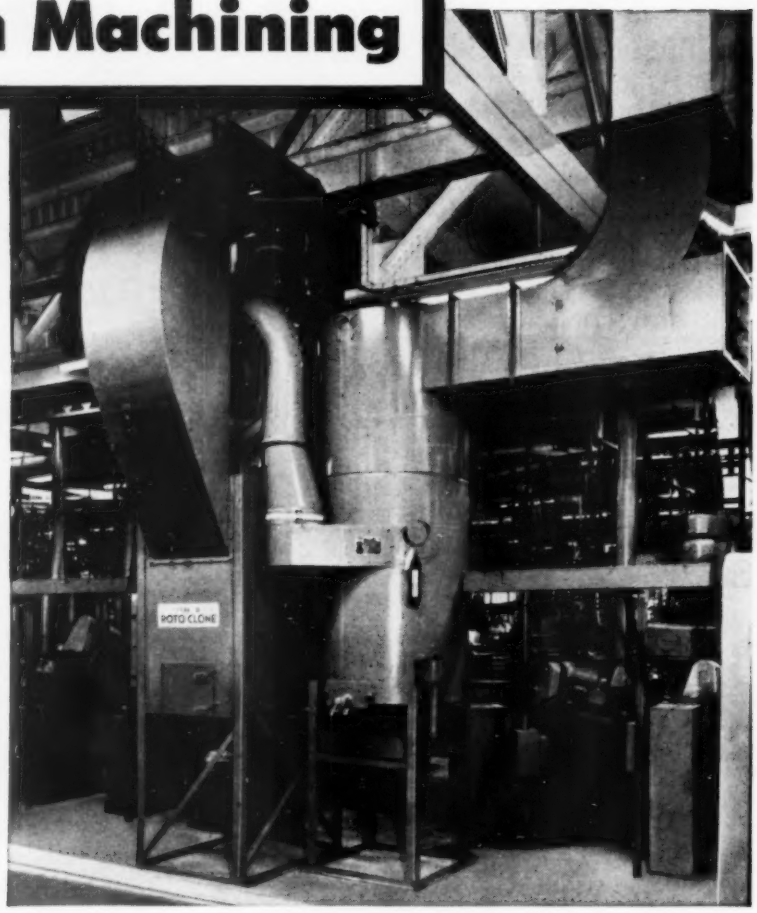
# Stop Cast Iron Dust from Production Machining

## ROTO-CLONE

**permits savings, too, through recirculation of cleaned air**




You "clean up" two ways with the application of ROTO-CLONE* dust control to cast iron machining operations. One, worker and workroom are free from the grime of this fine carbon and metal dust. Two, you enjoy definite fuel savings during the heating season. Reason—ROTO-CLONE'S complete cleaning action permits recirculation of the exhaust air to the work area.

Designed specifically for this service, the Model R Self-Contained ROTO-CLONE is actually a three-phase collection assembly. First, the chips are removed by a Skimmer Precleaner. Next, bulk of dust is collected by a Type D ROTO-CLONE. Lastly, the remaining fines are collected as a sludge by a TO-8 Cycoil Oil Bath Air Cleaner. Final result—99% cleaning efficiency achieved by a unit requiring a minimum of floor space and maintenance.

Is it field-tested? Today, 27 installations of Model R ROTO-CLONES are *recirculating* 1,300,000 cfm from cast iron machining operations. Let us show you how to clean up cast iron dust at a neat saving. Just call your local AAF representative or write us direct for complete product and performance data.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

**American Air Filter**
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, Cal.

AAF

**For more facts circle 584 on Reply Card**

# NEW PRODUCTS

(Begins on page 122)

seated against the globe. Two of these threadings are inside the hood; the other is around the inside of the globe holder. Each male threading is seated against a corresponding female threading. A rubber O-ring gasket has been inserted above the threaded fitting at the top of the hood to seal off the receptacle compartment. The one-piece assembly of globe, holder, guard and reflector is threaded high up inside the hood to prevent leakage into the lower section of the fixture.

All types of reflectors are available on 100-, 150-, 200-, 300- or 500-w fixtures, as are such accessories as breather, frosted globe or half shade. Crouse-Hinds Co.

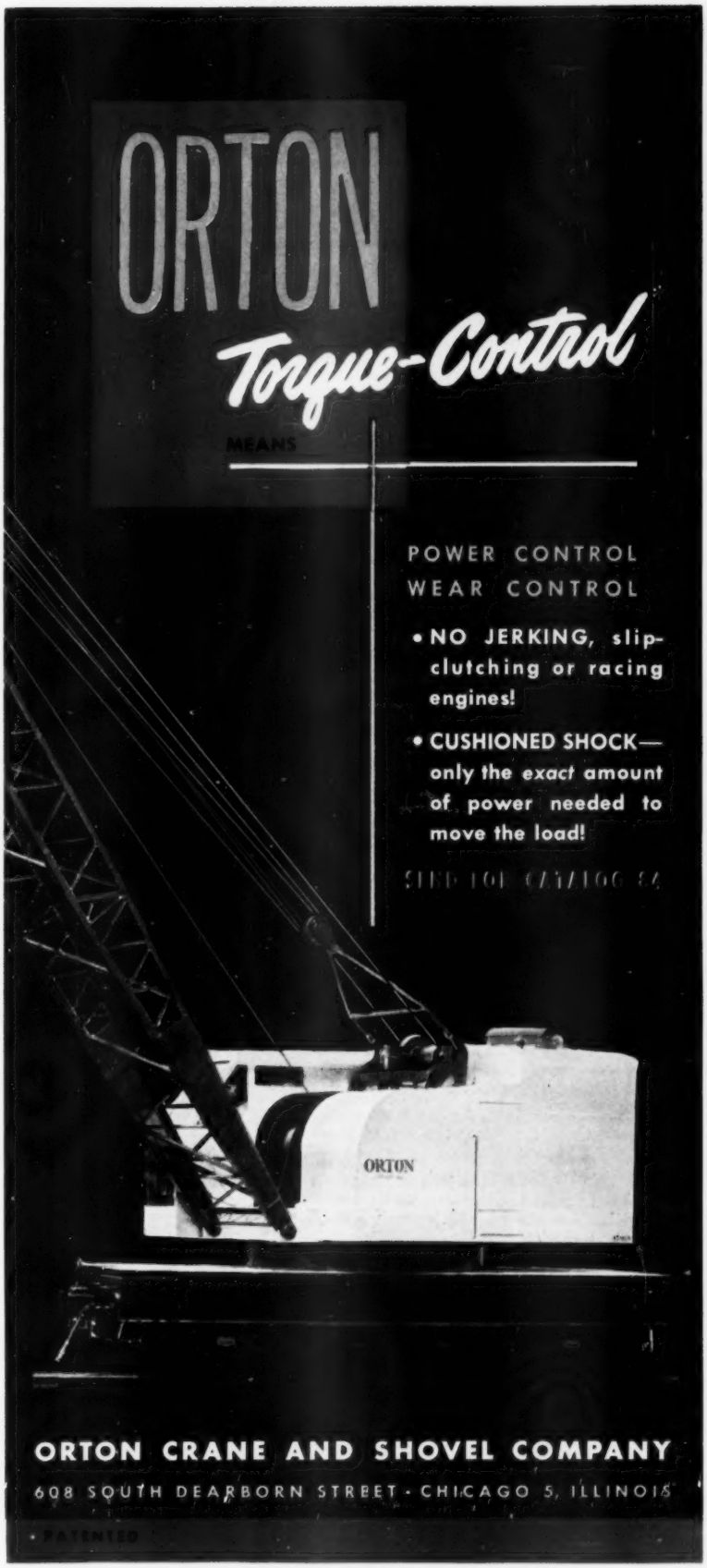
## 35—STOKER is hydraulically driven and controlled unit

Newest of this manufacturer's single retort underfeed stokers is the Fluid-Ram, hydraulically driven and controlled. This compact stoker is designed to provide unobstructed access

to fire doors, sifting doors and ashpit doors. The hydraulic fuel feed control offers a wide range of fuel regulation, making the unit well suited for automatic combustion control where wide range load operation is desired. It is further described in Bulletin SB-47. Erie City Iron Works.

## 36—BLAST CLEANING BARREL in larger, smaller sizes

The Blastmaster Rotoblast Barrel, formerly available only in 6- and 12-cu ft sizes, is now to be offered in 3- and 18-cu ft sizes. The two new sizes (3GN and 18GN) will have the same construction features as those already on the market, including a door of all-metal construction laminated with a rubber back to protect it from abrasive. The side edges of this door have rollers which travel in a mechanical labyrinth, and the door moves up and down like a window curtain, operated by a crank which winds or unwinds the roller. Another feature is a heavy rubber curtain between door and blasting area to protect the door against flying abrasive and damage by castings. The curtain rolls up and down with the door.


For more facts circle 585 on Reply Card

# NEW ...and built for YEARS of service!

**IN 24 SECONDS** one man can tilt and dump fully loaded dirt hopper.

**CAR-TYPE FEATURES,** like automotive steering, allow fast easy handling. Note rugged construction.

## TENNANT MODEL 75 POWER SWEEPER

**Here's a sweeper** built to *keep paying for itself for years*—the new fast-sweeping TENNANT Model 75.

Use it on tough round-the-clock jobs and see the difference that *heavy-duty* design makes. Fast, clean sweeping . . . quick dumping . . . and extra *years* of service with minimum downtime.

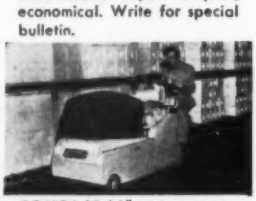
1 **SWEEPS FASTER.** Top capacity exceeds 100,000 sq. ft. per hour (with sidebrush and 6" overlap). Safe; drives like a car. Does clean job.

2 **DUMPS MECHANICALLY.** Ratchet lever dumps fully loaded hopper in 24 seconds or less. Saves time; operators like it. Easy to use.

3 **HIGHLY MANEUVERABLE.** Turns in only 60" radius (with or without sidebrush). Has instant reverse, rear wheel steering, positive braking action. Saves valuable time.

4 **HANDLES BULKY DEBRIS.** Over 11" front clearance of frame. For easier pickup of cartons, sweeping ramps, etc. *Write for details.*

**ELECTRIC** sweeper is quiet, economical. Write for special bulletin.



**COMPACT** 29" wide sweeper (Model 24) has many uses, does fast, clean job.

TENNANT Established 1870

**G. H. TENNANT CO.**
2572 N. 2nd Street
Minneapolis 11, Minn.

*Offices in Principal Cities*

**INDUSTRIAL FLOOR MACHINES**

CREATORS OF THE TENNANT SYSTEM OF FLOOR MAINTENANCE—MANUFACTURERS OF EQUIPMENT AND MATERIALS FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS

**For more facts circle 586 on Reply Card**

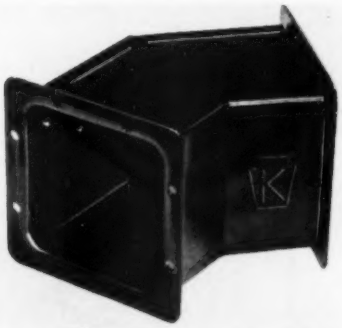

# NEW PRODUCTS

(Begins on page 122)

The Blastmaster Barrel also incorporates a non-pinch work conveyor consisting of a continuous hardened steel roller chain with heavy metal slats so designed that at no time is any opening presented to pinch the work or clog. The smaller of the two new sizes is powered by two ½-hp and one 1½-hp motors; the 18-cu ft size uses two 1½- and one 15-hp motors. Pangborn Corp.

## 37—FLANGED ELBOWS for electrical installations

Quicker electrical installations are said to be "just around the corner" with these flanged elbows. They are available in 22½ and 45 deg bends, designed to eliminate cutting or difficult fitting



when used with 2½, 4 or 6 in. square flanged hinged cover wireways. The elbows are flanged at each end to permit fast, easy assembly of wireway sections. They are made of heavy gage steel, finished in gray enamel. Keystone Mfg. Co.

## 38—RIVETED ROLLER CHAIN with single pin coupler

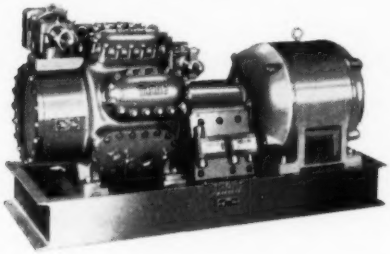
A step in the direction of solving the problem of machine down-time due to chain failure is announced in the form of a chain combining the long wearing characteristics of riveted roller chain and easy assembly of cottered chain.

Basically, this chain is supplied in ASA standard and heavy series, 1-in. through 2½-in. pitch sizes in multiple widths. It is made up in 10-ft lengths of riveted chain, having a specially designed single pin coupler installed at convenient intervals. Spacing of couplers varies, but they are placed in the assembled chain so any length can be made without cutting rivets or damaging parts. In the Baldwin-Rex Single Pin Coupler Link incorporated in this chain a single pin, easily removed, disconnects the chain. Center links or spacer plates cannot move or fall out when connecting the chain, manufacturer points out.

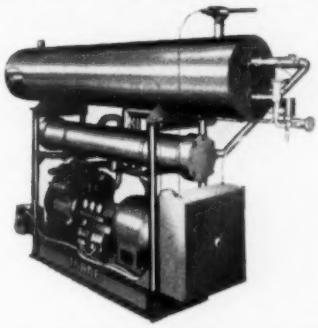
Each 10-ft section of chain is boxed individually, and any even pitch length of chain from 2 pitches to 10 ft can be made from one box of chain. Odd

# Here's how Trane refrigeration can help solve your production problems

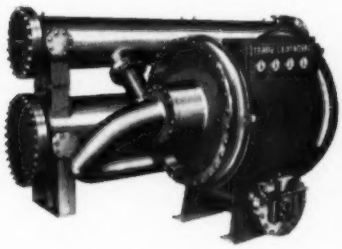
**DEHUMIDIFYING** and controlling moisture accurately can, as you well know, speed production, improve quality, reduce waste and spoilage. If this is your problem, talk to TRANE. TRANE Reciprocating Compressors, combined with TRANE Climate Changers, control humidity in textile mills, printing plants, storage areas, precision parts finishing and assembly rooms . . . and hundreds of other places. These compressors incorporate the most advanced engineering features. Capacities from 3 to 50 tons.



**WATER CHILLING** for industrial processes such as electroplating, metal quenching, die cooling, rubber mixing and multi-color printing is now available from a *single* packaged unit . . . the TRANE Cold-Generator. This unit is completely assembled, charged and tested before shipment. Only simple wiring and plumbing connections required. Ten sizes for loads from 10 to 100 tons.



**PROCESS AIR CONDITIONING** applications in many large plants require water chilling capacities greater than 50 tons. If this is true in your plant, read this: The TRANE CenTraVac, a hermetic centrifugal unit, provides 45 to 200 tons of refrigeration. Self-contained, easily installed, completely automatic . . . the CenTraVac runs without special attention. No shaft seals or gear boxes. Only two main bearings in entire machine.



**COMFORT AIR CONDITIONING** is needed at many places in modern plants . . . offices, drafting rooms, tabulating machine rooms and other heat-gain areas. It increases employee efficiency, pays dividends in cleanliness too. It's smart to air condition—with TRANE. TRANE Self-Contained units arrive ready to run. Only simple electrical and plumbing connections are required. Six sizes from 3 to 20 tons capacity.

**What's your special problem?** Whether yours is a simple cooling problem or a complex one . . . whether it's large or small . . . the complete line of TRANE matched air conditioning products contains the right size and type equipment to fit the job. For detailed information, call your nearest TRANE sales engineer, or write to TRANE, La Crosse, Wis.

*To solve any comfort or process air conditioning problem . . . talk to* **TRANE**

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 80 U.S. and 14 Canadian Offices

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

**For more facts circle 587 on Reply Card**

# For high voltage power users—

## Jefferson STEP DOWN Transformers

- Compact size for easy, out-of-the-way installations
- Mounts at point of use
- Quickly relocated at any time
- Dry Type—Air Cooled (No fire hazard)

## CUT COSTS—

## increase electrical efficiency

Installing Jefferson Power Circuit Transformers close to the load, improves voltage regulation, eliminates secondary voltage drop. You save copper and conduit by eliminating long runs of low voltage (115–230) secondary feeders. Being AIR COOLED there are no valves, gaskets or mechanical parts requiring constant maintenance. Jefferson Transformers are compact and lightweight and can readily be relocated if wiring or machinery layouts are altered.

All Jefferson Transformers are equipped with sturdy brackets for mounting directly on machinery or near point of low voltage use. Adequate wiring compartments with ½" and ¾" knockouts are provided. Listed by Underwriters' Laboratories, Inc. *Write for Bulletin 501-15.*

**JEFFERSON ELECTRIC COMPANY**
Bellwood, Illinois

**STOCK SIZES**
50 VA to 15,000 VA
460/230 V. Pri. —230/115 V. Sec.
575 V. Pri.—230/ 115 V. Sec.
Special voltages on request.

Jefferson POWER CIRCUIT Transformers

For more facts circle 588 on Reply Card


# NEW PRODUCTS

(Begins on page 122)

pitch lengths can be obtained by using a 3-pitch riveted offset section. Longer lengths are made by combining additional sections. Baldwin-Duckworth Div., Chain Belt Co.

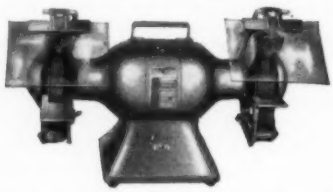
### 39—PLASTIC CABLE CLIP requires only one fastener

A new loop cable support, the Etholoc, is intended for use in applications in temperatures up to 150 F. It is made of ethyl cellulose, in sizes from ⅛- to

1¼-in. dia., and a lightweight type is also available in several sizes up to ¼-in. dia. The clip requires only one fastener, has rounded edges to grip securely. Weckesser Co.

### 40—SMALL UTILITY GRINDER features improved design

The 600 Series DeLuxe Grinder is designed to offer ample power for normal loads and adequate reserve power for temporary overloads. This compact unit is distinguished by wide clearance between wheels and motor frame to

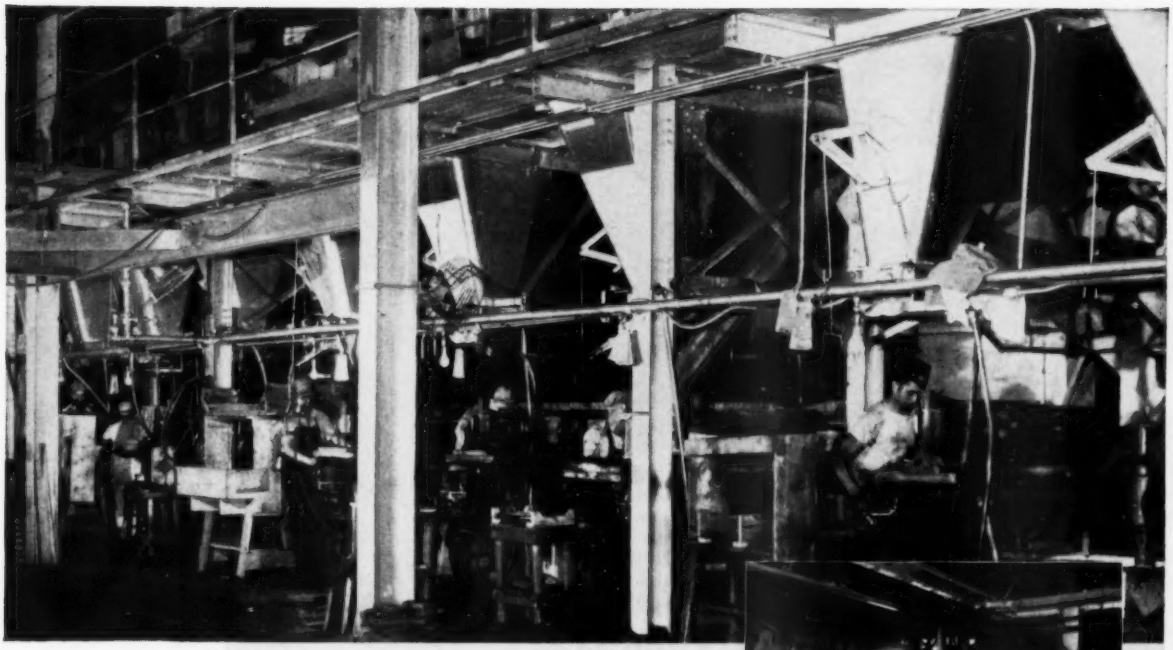


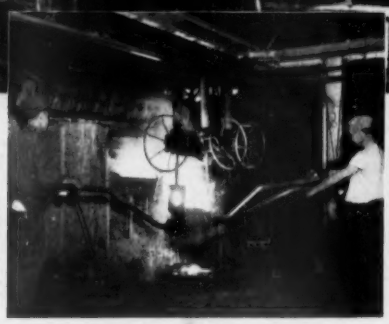
permit grinding of large and odd shaped pieces. And the motor frame (4⅝ in. dia) is smaller than the 6-in. dia wheels, which means that long objects may be applied against the wheel and passed across the motor frame. Other features announced include adjustable eyeshields, tiltable tool rests and carrying handle. The grinder is offered in ¼- and 1/3-hp ratings. Baldor Electric Co.

### 41—WET BLASTING MACHINE for finishing small parts

The Model 30 Liquamette is intended for precision cleaning and finishing applications involving small pieces that can be handled manually. Typical applications include the manufacture and maintenance of small dies, and of glass, plastic and small rubber molds; the reconditioning of valves, pistons, rods, and such plant equipment as oil burners; and the surfacing of tools before and after plating.

This machine is 2 ft 6 in. long and wide by 6 ft 11 in. high, with a blasting compartment 30 in. square and 2 ft 7 in. high. It has one vertical sliding





*Knight Services Includes:*

- Plant Engineering
- Survey of facilities
- Plant Design
- Construction
- Modernization
- Mechanization
- Materials Handling
- Production Control
- Cost Control
- Industrial engineering
- Wage Incentives
- Organization
- Management

## Knight-Engineered MODERNIZATION PROGRAM IS INSTALLED WITHOUT INTERRUPTING PLANT OPERATION—

### AND RESULTS IN INCREASED OUTPUT OF 33⅓%

This successful program was put into operation—step by step—without substantial interference to existing production. Continued operations during the modernization process were made possible by careful scheduling of necessary changes.

Modernization was accomplished without an increase in floor space and resulted in improved product quality, better working conditions, and a stronger competitive position for the company.*

**This plant is a good place to work.**

***Whatever your industrial problem, you'll benefit by the broad experience of Knight Engineers. For prompt attention, call our Chicago or New York office.***

**Name supplied upon request.*

EVIDENCE OF EXPERIENCE

# Lester B. Knight & Associates, Inc.

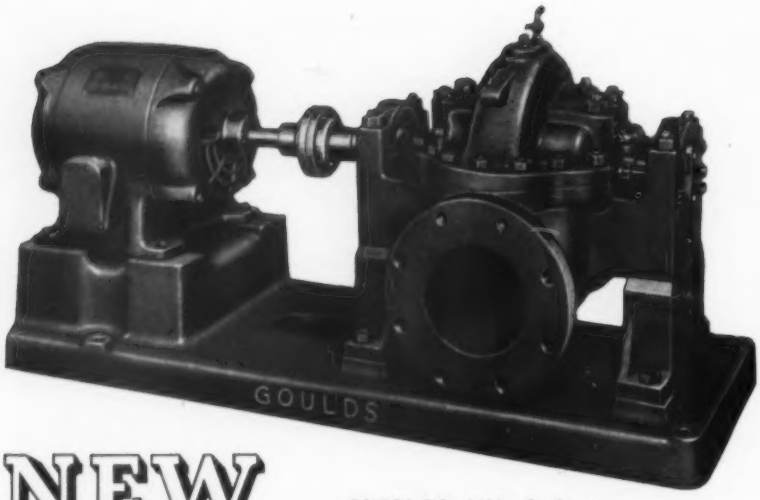
*Management, Industrial and Architectural Engineers*

MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

600 W. Jackson Blvd., Chicago 6

*Eastern Office—Lester B. Knight & Associates, 50 Church St., New York City 7*

**For more facts circle 589 on Reply Card**




# NEW GOULDS PUMP

GOULDS FIG. 3405 — Single stage, double suction centrifugal pump. Heads to 260 ft. Capacities to 6400 G.P.M. For general purpose pumping.

## GIVES YOU 5 BIG COST ADVANTAGES

**1** ***Combines seven design features that mean high operating efficiency and low maintenance.***

Every one of the following construction features is standard with this new design:

a. Renewable stuffing box bushings.
b. Bearing housings sealed against moisture and dirt.
c. Cowl-type glands suitable for use with quenching liquid.
d. Stainless-steel impeller keys.
e. Teflon water-seal rings.
f. Die-formed stuffing box packing.
g. Corrosion-resistant gland bolts.

**2** ***Interchangeability of parts.***

Only three shafts and rotating parts assemblies provide for 19 pump sizes. This means you get:

a. Great flexibility in making field changes.
b. Low initial cost due to standardization of manufacture.
c. Reduced spare parts inventories.

**3** ***Saves floor space.***

Short bearing spans cut over-all lengths as much as 50%.

**4** ***Flexibility of stuffing box.***

You can use either conventional stuffing boxes or mechanical seals —and change from one to the other.

**5** ***Easy rotation change.***

You can change from right- to left-hand rotation or vice versa in the field without construction change because of an unique device locking shaft sleeves.

**GET FULL DETAILS from the 12-page illustrated bulletin, No. 721.6, covering the complete details of the new Goulds Fig. 3405, including specifications, interchangeability tables and performance curves. Be sure you have the whole cost-advantage story before you select another general purpose pump. Contact your nearest Goulds representative or write to Goulds Pumps, Inc., Seneca Falls, N. Y.**

MEMBER HYDRAULIC INSTITUTE USA

Goulds PUMPS INC. Seneca Falls New York

For more facts circle 590 on Reply Card

# NEW PRODUCTS

(Begins on page 122)

door 1 ft 10½ in. wide and 1 ft 7 in. high. A rotating work table is available for holding the work in the blasting compartment and small portable auxiliary tanks are available to receive parts from blast chamber for rinsing.

Advantages attributed to the unit include push button controls, a vertical slurry pump adaptable to rugged service, and the holding of close tolerances where required. A safety advantage is noted in the fact that the machine height permits the average operator to stand on the floor. He stands outside the cabinet with arms extended through the gauntlets and manipulates the abrasive gun with his hands while operating the compressed air valve with his knee. American Wheelabrator & Equipment Corp.

**Use the Reader Service Cards on pages 35-36 and 169-170 to ask for more information on these products. Circle item numbers of products in which you are interested.**

### 42—HOPPER MAGNET for removing ferrous particles

A new permanent magnetic hopper magnet is designed to remove iron contamination from many free flowing materials in which the presence of iron particles is undesirable for reasons of product purity, machinery protection or fire prevention. The hopper unit consists of a series of steel discs spaced at 1-in. centers with cylindrically shaper, powerful Alnico V permanent magnets occupying the space between discs. These discs serve as pole plates for the magnets and are designed to cause symmetrical distribution of magnetic field over the most effective areas.

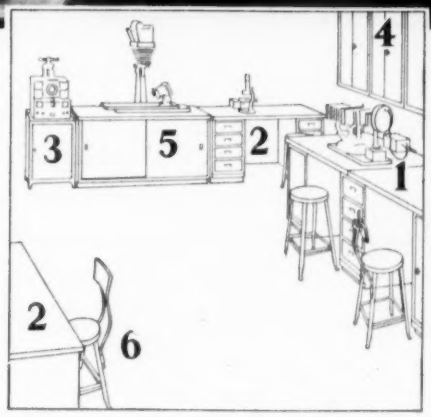
Originally developed for hoppers with sloping sides, the unit can be used in other locations with proper supports, and will perform in wood or steel hoppers. The magnetic separator can be lowered into a hopper so that the steel discs rest on the two sides of the hopper. The end discs contact the other two sides, providing a magnetic barrier covering the hopper discharge opening. Material flowing into the hopper passes between the discs, the non-magnetic material going through while the tramp iron is trapped. Eriez Mfg. Co.

### 43—DIAPHRAGM VALVE for corrosive, abrasive fluids

Valves in the new X-V Series are primarily designed for such applications as shut-off, throttling and control of acids, chemicals and other corrosive and abrasive fluids. Their principal design feature is individual functioning or diaphragm and disc. Thus, sealing

## A METALLURGICAL LAB — CUSTOM BUILT with Standard HALLOWELL Shop Equipment

It's easy to custom build a laboratory, toolroom, gage room or assembly line with standard HALLOWELL Steel Shop Equipment. Just lay it out as you want it—then order standard, ready-made units from your local HALLOWELL distributor. Let us send you complete information. SPS, Jenkintown 26, Pa.




1. Continuous Unit Bench
2. Individual Unit Benches
3. Tool Cabinet
4. Wall Cabinets
5. Cabinet Bench
6. Stools and Chairs

*Our Fiftieth Year* : A START FOR THE FUTURE

HALLOWELL SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

**For more facts circle 591 on Reply Card**

**HANDY CATALOG** Simplifies specifying of Osborn maintenance brushes. Write for your free copy.

# Want top quality in brushes? ...just specify "OSBORN"

LOWEST end-of-service cost is the thing that counts in brushes. You get this when you specify OSBORN. Built with only the finest materials and workmanship, each brush will do its job longer. Osborn brushes are backed by more than 60 years of service to Industry. Carried in stock by leading Industrial Distributors. *The Osborn Manufacturing Company, Dept. T-2, 5401 Hamilton Ave., Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

For more facts circle 592 on Reply Card

# NEW PRODUCTS

(Begins on page 122)

the mechanism and seating the disc are accomplished separately, it is pointed out, and, as a result, the diaphragm is not subjected to seat wear and abrasion. In severe applications, this design feature makes it possible to close the value in case of diaphragm failure.

The valves have bodies of cast iron, 316 stainless steel or Hastelloy C, and are available unlined or lined with same material as diaphragm and disc. Diaphragms are made of rubber, Neoprene, Kel-F or Buna-N. Sizes range from ½ through 4 in. Connections are flanged, screwed or union. Diaphragm motor valves are also available. Farris Flexible Valve Corp.

## 44—CENTRIFUGAL PUMP is compact, close coupled

The Fig. 3624 Pump was developed with special attention to air conditioning requirements, but its compactness and performance characteristics make it applicable to other industrial services. It delivers up to 110 gpm and operates at heads to 110 ft. Electric drive motors range from ¼ to 2 hp. Discharge outlets are tapped for 1- or 1¼-in. pipe.

Motor and pump form a single complete unit, installed by bolting the unit down and connecting piping and power. The single-suction type impeller is statically balanced, threaded directly on the motor shaft and additionally secured by a stainless steel jam nut. Casing of this pump is vertically split for inspection and maintenance without disturbing piping connections. The discharge nozzle can be turned to any one of eight positions. The Fig. 3624 Pump has a mechanical seal which is protected from running dry once the pump is primed, and which prevents leakage, company says, adding that this seal doesn't bind the shaft, or require adjustment, and is easily replaceable. Interchangeable parts make it possible to convert from one size to the other by changing only the impeller and casing. Bulletin 624A3 describes the pump. Goulds Pumps, Inc.

## 45—ELECTRONIC CONTROL for liquid level regulation

Based on the capacitive action of liquid surrounding a porcelain-enamel-covered electrode, the Belmont Level Control provides adjustment of liquid level and cut-in, cut-out differential over wide limits. In operation, the new unit consists of a probe, mounted directly at the location of the controlled liquid; a connecting cable which can be up to 1000 ft long; and the control unit located for operating convenience. The two main controls (liquid level and differential) are designed for screwdriver adjustment while a Vernier or fine control on liquid level is operated by a panel-front knob. Thermo Instruments Co.


HOW DUST IS ELIMINATED in the manufacture of Exide batteries

View of the Dustube Collector for recovery of lead dust.

Four of the battery plate brushing machines. Note hooding for corraling all dust created.

DUSTUBE® COLLECTOR *keeps working areas clean and healthful*

Battery plate cleaning and trimming operations at The Electric Storage Battery Company's Chicago plant created manifold dust control problems. The number of processing stations involved and the characteristics of the dust — lead oxide — necessitated extensive hood designs to control the dust at its source and high efficiency collector equipment to salvage the valuable material.

The solution to the problem, as illustrated in the pictures above, consists of adequate hooding at the dust creating stations plus a large Dustube cloth tube type Collector. Results have been "highly satisfactory" according to plant officials. Working areas are clean and healthful. The lead oxide is recovered in the dry state and is handled without de-watering, drying or other processing.

The Dustube Collector has an unusual flexibility in handling dust or fume in all types of chemical processes. Its simple, practical design provides the highest efficiency at the lowest cost. Get the facts for your problem. *Write for Catalog No. 372.*

American dustube COLLECTORS

WHEELABRATOR & EQUIPMENT CORP.
839 S. Byrkit St. Mishawaka, Indiana

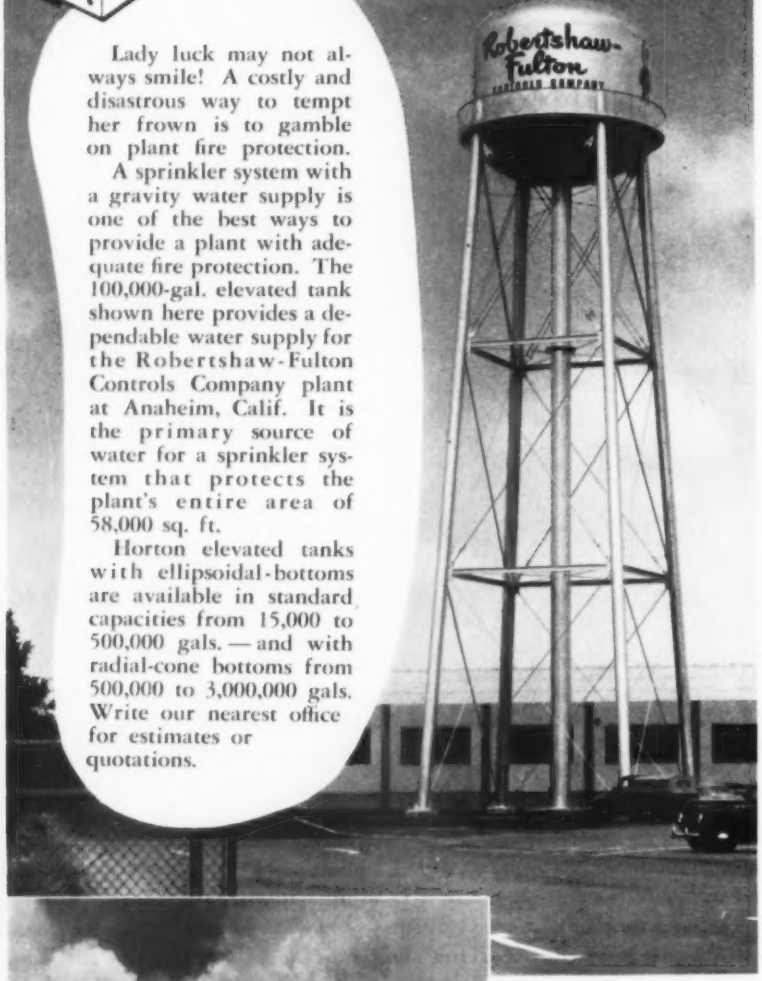
For more facts circle 593 on Reply Card

# Don't Gamble on Fire Protection

Lady luck may not always smile! A costly and disastrous way to tempt her frown is to gamble on plant fire protection.

A sprinkler system with a gravity water supply is one of the best ways to provide a plant with adequate fire protection. The 100,000-gal. elevated tank shown here provides a dependable water supply for the Robertshaw-Fulton Controls Company plant at Anaheim, Calif. It is the primary source of water for a sprinkler system that protects the plant's entire area of 58,000 sq. ft.

Horton elevated tanks with ellipsoidal-bottoms are available in standard capacities from 15,000 to 500,000 gals. — and with radial-cone bottoms from 500,000 to 3,000,000 gals. Write our nearest office for estimates or quotations.



*The 100,000-gal. Horton elevated tank above is helping protect the Robertshaw-Fulton Controls Company plant at Anaheim, Calif. from disastrous fires such as this.*

**CHICAGO BRIDGE & IRON COMPANY**

| | | | |
|---|---|---|---|
| Atlanta 3 | 2148 Healy Building | Houston 2 | 2166 C & I Life Building |
| Birmingham 1 | 1555 North Fiftieth Street | Los Angeles 17 | 1574 General Petroleum Building |
| Boston 10 | 1067—201 Devonshire Street | New York 6 | 3317—165 Broadway Building |
| Chicago 4 | 2134 McCormick Building | Philadelphia 3 | 1649—1700 Walnut Street Building |
| Cleveland 15 | 2258 Midland Building | San Francisco 4 | 1582—200 Bush Street |
| Detroit 26 | 1569 Lafayette Building | Seattle 1 | 1370 Henry Building |
| Pittsburgh 19 | Alcoa Building | Tulsa 3 | 1669 Hunt Building |

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.


## Plant Utilities

(Continued from page 87)

ferring to the electrical layout, for example, the observer finds that he does not have to search through a mass of lines and symbols to find the utility in question.

The question may arise as to why all data must be so exact. Industry is growing, and the plant engineer's job is to look forward not days, but years. He must visualize building and land expansion and must be able to furnish construction contractors with detailed information on any possible interference of underground utilities; he must further anticipate production growth in regard to future demands for power and other utilities.

By applying a proposed building in its correct location on the taped working map, he is at once able to determine the availability of utilities as well as recognize any drawbacks which might make the site unsuitable.

In general, it is the duty of every plant engineer to have his maps and data so organized as to permit instant comprehension by others in his absence. If he will but recall the difficulties he had in collecting such data, he will be doing his successor and industry a great service in accurately and currently keeping his office in good order. Upon his success in recording his data will depend his firm's opportunity to save a considerable amount in avoidable expenses connected with plant maintenance and property improvement.

His diligence in the study of property ownership, easements and rentals is highly desirable. The author, for instance, while checking a new land purchase, found that his firm owned a well populated city street and that the company was financially liable for injuries or mishaps which might occur while they held the title. This, of course, was very quickly remedied by re-dedicating the street to the municipality.

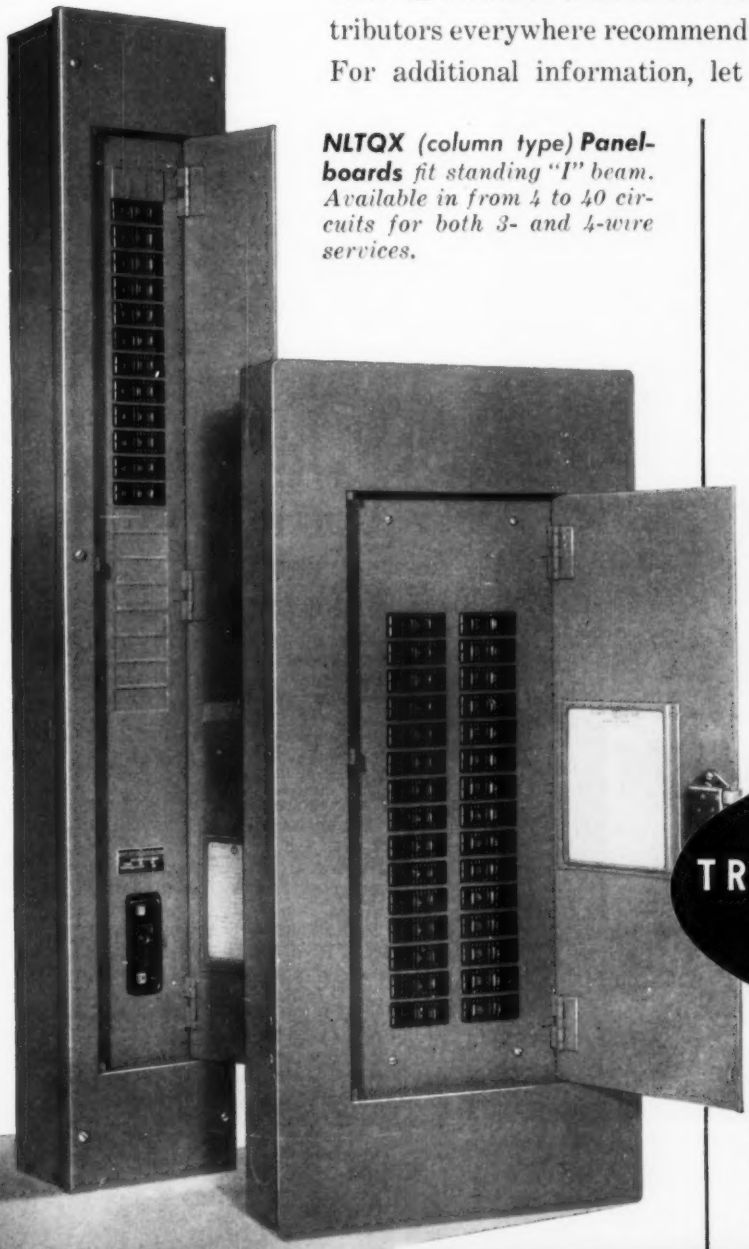
The study and accurate recording of utility factors affecting the production operation highly affects profit plans for any industrial plant in relation to economic conditions. No firm can guarantee business conditions tomorrow and the plant engineer who does his job well should, at any time, be able to report to management how long the plant can operate without expenditures on the utility systems.

The plant engineer is truly the historian and prophet of the company's holdings. Untold research to rout out data relative to the growth of his firm and further study to predict the life of buildings and utilities are his constant care and unless he ably performs those duties, he risks loss of production, expensive maintenance, increased building costs and many small costs for his firm.

# PICK TRUMBULL NLTQ LIGHTING PANELBOARDS

*..for more convenience in less space with maximum protection and flexibility for future needs*

Trumbull's fifty-year leadership in panelboards has never been more in evidence than in its NLTQ line. Leading electrical distributors everywhere recommend them and carry complete stocks. For additional information, let us mail you Bulletin TEB-14.



***NLTQX** (column type) **Panelboards** fit standing "I" beam. Available in from 4 to 40 circuits for both 3- and 4-wire services.*

## 3 WAYS BETTER...

***1. Circuit breaker convenience and protection.*** Type TQL. Quick-make, quick-break Thermal-magnetic trip, arc-quenching design and trip-free action for top protection. Convenient plug-in design and manual re-set. Equally important, it has a separate trip indicating position.

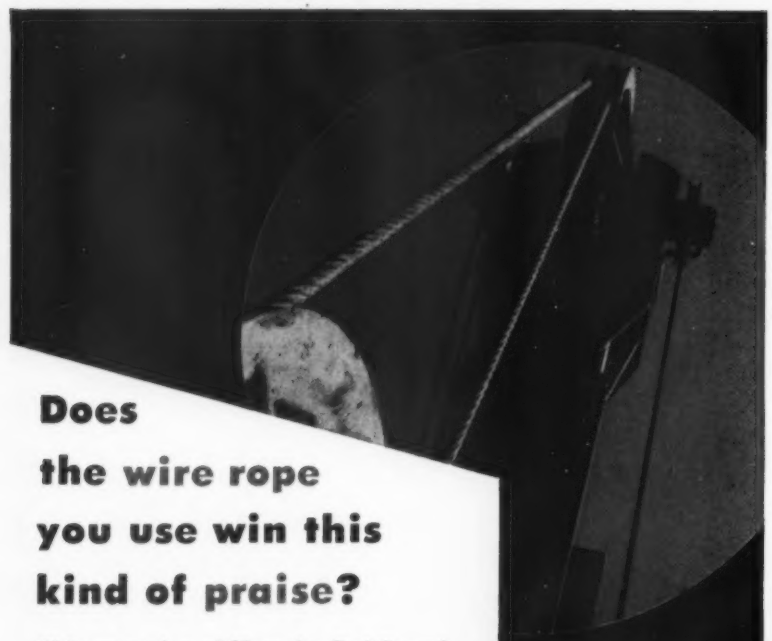
***2. Strong compact interiors readily removable for fast installation.*** Busbars molded in plastisol, and braced against damage from current surges. Run cooler than in open air.

***3. Compact boxes, protected fronts.*** Adequate knockouts and gutters. Front integral with barrier. Breaker knockouts in front panel to provide for future circuits.

**TRUMBULL (T) ELECTRIC**

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

***NLTQ Panelboards** available in from 4 to 42 circuits for both 3-wire and 4-wire services with lugs only or Trumbull 50 to 225 ampere breakers in the mains, and TQL 120 volt, 10 to 50 ampere circuit breakers on branches. AC only. Underwriters' Laboratories, Inc. listed.*



**Does the wire rope you use win this kind of praise?**

"I have preferred Hercules Red-Strand wire rope since 1909," says an operations superintendent. "I just wouldn't use any other." Another operator reports a truly remarkable record: "Red-Strand outlasted any other rope by three times!"

**HERCULES Red-Strand *earns it***

Why do these men, among others, praise Red-Strand so highly? In a few words, it's because *higher-than-rated quality* In Red-Strand wire rope means *longer-than-expected* service . . . year in, year out.

Next time, use Hercules Red-Strand. You'll experience the difference too.

HERCULES® Red-Strand wire rope made by A. Leschen & Sons Rope Company, St. Louis 12, Missouri

*In business only to make wire rope . . . better wire rope . . . since 1857*

HIGHER-THAN-RATED QUALITY

LESCHEN

WIRE ROPE AND SLINGS

A. LESCHEN & SONS ROPE COMPANY

DISTRIBUTORS IN ALL PRINCIPAL CITIES

**For more facts circle 596 on Reply Card**

## Tool Control System

(Continued from page 84)

cation: Class 1 (.00000-.000020 accuracy) once each month; Class 2 (.000020-.000040 accuracy) once every six months; Class 3 (.000040-.0001 accuracy) are checked once every year.

In order to maintain accuracy, one of the two master Hoke block sets is sent alternately every six months to the Federal Bureau of Standards at Washington, D. C., for certification. These two sets of masters are the bases for all measurement in the IBM Endicott plant.

In addition, all gages including mechanical gages, comparator fixtures and all standard gages such as plug, plug thread, ring and ring thread gages are checked each time they are returned to crib location.

Gages kept at inspection stations throughout the plant are checked every four months.

All special-purpose gages (carrying part and tool number) are returned to the gage crib at the end of the run of parts or every thirty days, whichever may be less.

Any rejection of gages or request for repair is made on a special form which, with the gage, is submitted to the gage crib.

The repair of a gage shall be governed by the results of its inspection and is authorized by the inspector. A copy of his authorization remains on file in the gage crib until return of the gage, while the other copies always accompany the gage to the Tool Room.

# NEW BOOKS

### for the plant engineer

## Know What It Costs

**ENGINEERING VALUATION AND DEPRECIATION by A. Marston, R. Winfrey and J. C. Hempstead. Second edition; size 6 by 9 in.; 508 pp, including index; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $8.00.**

THIS VOLUME retains all the major subject material which appeared in Marston and Agg's Engineering Valuation; however, it has been totally rewritten, rearranged and modernized.

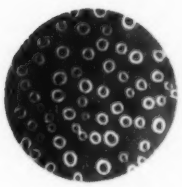
The text deals with concepts and procedures involved in the appraisal of industrial, commercial, utility, and natural resource properties for which it is desirable that engineers perform the appraisal.

Several chapter headings are mentioned to give the reader some idea of the amount of material covered in this book: property and other ac-

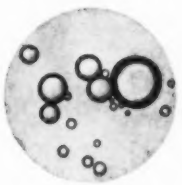
RIGHT IN YOUR OWN BACK YARD ... BY WEST

BUGS KNOW IT'S THE KISS OF DEATH WHEN THE WEST MAN TURNS ON THE NEW ATOMIZER
A TWIST OF THE WRIST AND IN TWO MINUTES THIS PLANT WILL LOOK LIKE A LONDON FOG!
WOW! THIS JOB USED TO LOUSE UP THE WEEKEND FOR FIVE MEN. AT DOUBLE TIME!
WEST ATOMIZERS? WOW! WE'RE SITTING DUCKS IN THIS CRACK!
YOU'LL STILL SWING A MOP, THUNDERFOOT. THIS IS A BUG KILLER, NOT A JANITOR!
BET THIS BLOWS MY JOB RIGHT OUT THE WINDOW!
TRAPPED BY VAPOSECTOR! SAME DIRTY TACTICS THAT WIPED OUT OUR COUSINS AT THE CANNERY!
JIGS UP! IT'S THIS OR WEST FUMIGANTS OR WEST RESIDUALS!
WHAT STRATEGY! THEY'VE MAPPED OUT AN INSECT CONTROL PLAN THAT'S STOPPED US COLD!
HEY! WAIT A MINUTE... WHO'S GONNA CARRY US OUT?

# Fog 1,000 cu. ft. in 3 seconds for 5¢



**Top** — Magnified photo of uniform 8 micron droplets produced by precision-machined suction nozzles of West Atomizing equipment. "Dry mist" remains air-borne for prolonged periods.



**Bottom**—Magnified photo of droplets produced by ordinary hydraulic compressor sprayers. Vary from 2 to 300 microns. Larger droplets fall, wetting floors and reducing effectiveness.

— and with only 1 ounce of Vaposector — for complete control of flying insects. Double this dosage for crawling insects.

Impossible? Not with a permanently installed West Atomizer. 10 suction nozzles atomize a "dry mist" of extra-potent insecticide. Droplets are so small they hang in the air . . . seep into every crack . . . penetrate delicate insect breathing tubes.

It's an unbeatable combination. High potency Vaposector — sprayed with super-efficient West atomizing equipment. One man does the job. There's only one valve to open. You can fog your entire plant simultaneously.

West has a complete line of insecticides and atomizing equipment ranging from permanent installations to portables. A West specialist will be glad to make a survey and set up an Insect Control Program to fit your needs. Without obligation. Just mail the coupon.

WEST DISINFECTING Company

42-16 West Street, Long Island City 1, N. Y.

**YES! Tell us about your Insect Control Plan**

☐ Please send me the West Insect Control Booklet

☐ Have a West Insect Control Specialist call DEPT. 52

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

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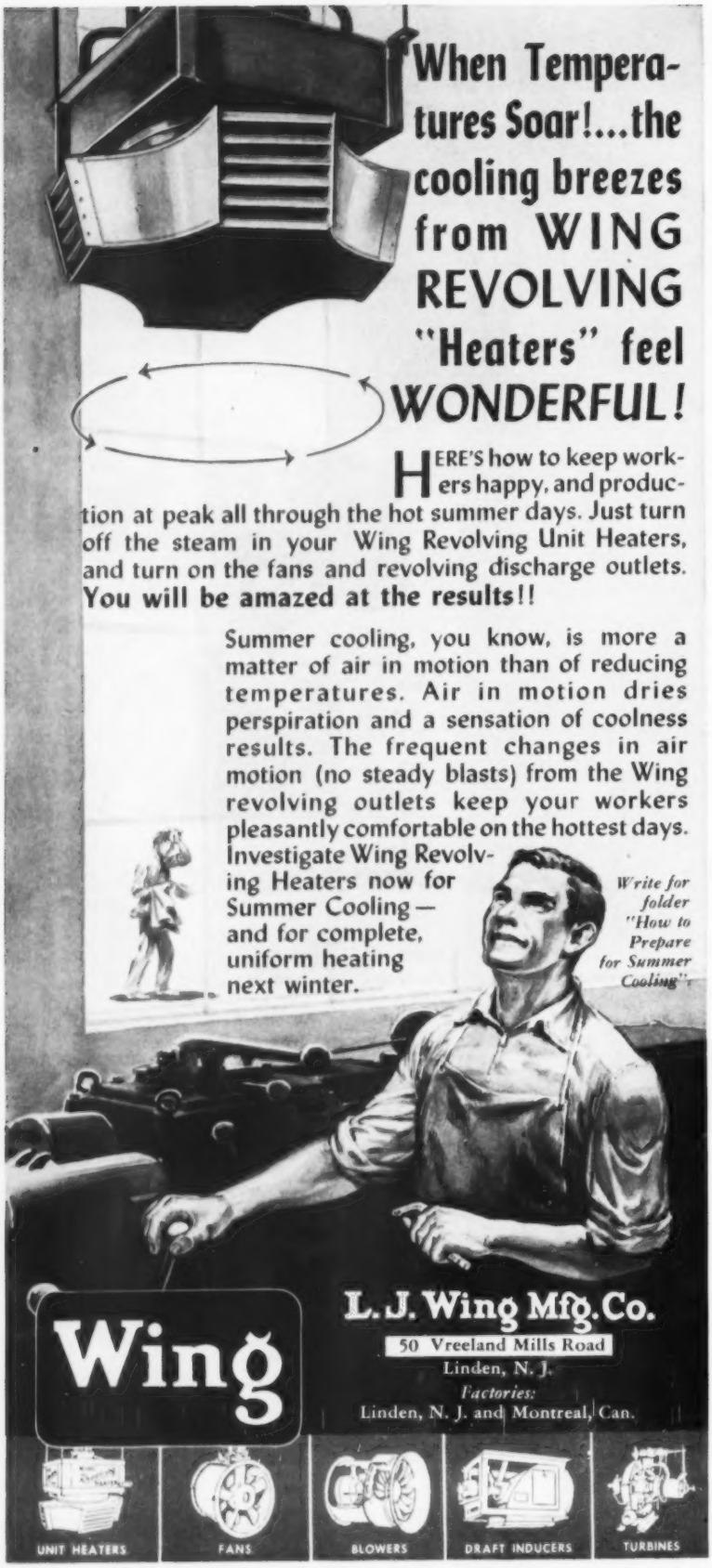
When Temperatures Soar!...the cooling breezes from WING REVOLVING "Heaters" feel WONDERFUL!
HERE'S how to keep workers happy, and production at peak all through the hot summer days. Just turn off the steam in your Wing Revolving Unit Heaters, and turn on the fans and revolving discharge outlets. You will be amazed at the results!!
Summer cooling, you know, is more a matter of air in motion than of reducing temperatures. Air in motion dries perspiration and a sensation of coolness results. The frequent changes in air motion (no steady blasts) from the Wing revolving outlets keep your workers pleasantly comfortable on the hottest days.
Investigate Wing Revolving Heaters now for Summer Cooling — and for complete, uniform heating next winter.
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counting records; costing the inventory; methods of estimating service lives; depreciation principles and relations; methods of estimating depreciation; valuation of land; appraisal of the liquid assets; and fair value of the enterprise.

## Handling Equipment

**HANDBOOK OF MANUAL MATERIALS Handling Equipment. Size 11 by 8½ in.; 48 pp; illustrated; paper bound. Published by the Caster and Floor Truck Manufacturers' Association, 27 East Monroe St., Chicago 3, Ill. Price $1.00.**

THE AIM of this publication is to acquaint the reader with basic types of materials handling equipment and some of the terminology. The booklet is liberally illustrated and uses simplicity in its explanations and instructions.

Each section in the publication presents information on how a certain type of equipment is made and why it is made. Attention is given to the use or application of equipment. The reader is also told how to determine the equipment that he is to use. Finally, there are instructions on how to use a catalog.

The following sections appear in the book: industrial wheels; casters; two wheel hand trucks; platform trucks and trailers; pallets and skids.

## On Construction Material

**CAREYSTONE CORRUGATED Asbestos-Cement Roofing and Siding Manual. Size 11 by 8½ in.; 82 pp; illustrated; paper bound. Published by the Philip Carey Mfg. Co., Cincinnati 15, Ohio. Price 50 cents.**

THIS MANUAL contains architectural and engineering information incorporating many drawings which illustrate the use of corrugated-asbestos-cement sheets. Included in this book are suggested specifications as well as suggestions to users, and tips on estimating quantities.

Pages in this manual can be easily taken out or inserted. The publisher is planning to keep owners of these manuals up-to-date by supplying additional new pages.

## On Air Conditioning

**TRANE AIR CONDITIONING Manual. Size 11 by 8½ in.; 380 pp; illustrated; cloth bound. Published by The Trane Company, La Crosse, Wisconsin. Price $5.00.**

THE SECOND MAJOR revision of this useful manual presents a brand new addition in the chapter on fans and ducts. The new chapter alone costs one dollar. If a copy of the manual were purchased in a six-month period prior to the publication of the new edition, the buyer may get the new chapter at half price.

The basic principles of physics

All power trucks lift, move and stack

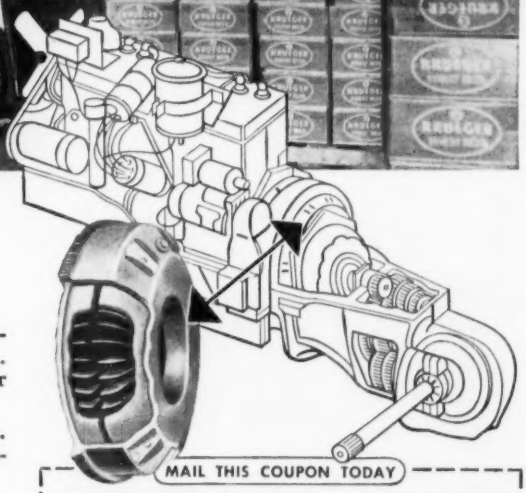
# BUT ONLY YALE GAS TRUCKS HAVE FLUID DRIVE

**Smooth, trouble-free Fluid Drive gives you 3 to 8 times longer clutch life... saves costly, work-stopping clutch repair and too-frequent replacement.**

*Less down time* is just one of the big advantages of Yale-exclusive Fluid Drive. You get continuous, stall-free operation... smoother stops and starts to protect your load as well as your operator.

*Other Yale Gas Truck features*... many of them exclusive... include rugged 65 HP Industrial Engine—safer, surer Automotive-type Brakes—Shockless Steering—Hypoid Gears.

*Yes, YALE Trucks and attachments* lead in money-saving efficiency... cut costs as much as 75% in industries everywhere. And, every Truck YALE makes... Gas, Electric, Diesel, LP-Gas or Gas-Electric... is subject to rigid Quality-Control checks at every stage of manufacture.



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**Roosevelt Blvd. and Haldeman Ave., Phila. 15, Pa.**

☐ Please send my free copy of *Picture Story of Yale Materials Handling Equipment.*

Company_____

Name_____ Title_____

Street_____ City_____ State_____

*In Canada write:* The Yale & Towne Mfg. Co., St. Catharines, Ontario, Canada

# YALE*

**MATERIALS HANDLING EQUIPMENT**

**Registered trade mark*

**Gas, Electric, Diesel Lift Trucks • *Worksavers* • Hand Trucks • Hand and Electric Hoists • Pul-Lifts**

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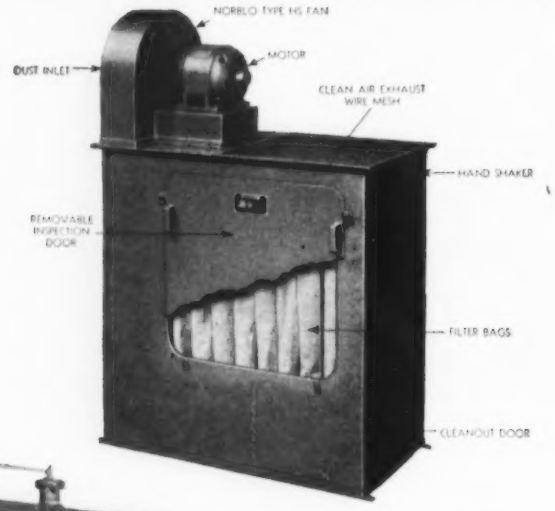
**Keep workroom air clean—**
**protect work and workers with**

**Norblo**

**Portable bag-type Dust Collectors**



Many plants can be effectively and profitably equipped with Norblo Portable and Semi-Portable Dust Collection Units, to remove unhealthful and sometimes dangerous contaminants from dust-producing machines. Localized dust control for grinding, polishing, sawing and other operations is thus provided at much lower cost than with a large centralized system.

Norblo Portables occupy small space, can be elevated to save floor area. And they're easily moved if re-location of machines proves desirable. Units are available in various arrangements for dust clean-out. Six sizes range from 300 to 1350 C.F.M., operate at 8" static pressure at the fan. Also larger sizes—semi-portable. Write for Bulletin 163-5.

**The Northern Blower Company**

**Engineered Dust Collection Systems for All Industries**

**6423 Barberton Ave. OLympic 1-1300 Cleveland 2, Ohio**

**For more facts circle 600 on Reply Card**

appear in the first chapter. These deal with heat and cold. The psychrometric properties of air are discussed in another chapter with special attention being given to the use of the chart.

Refrigeration, calculations for conditioned air supply, water for air conditioning, heat gains and comfort are the other topics covered.

A section in the back of the book is devoted to reference tables. Some of these pertain to the following: specific heat of substances; properties of saturated steam; weight of freon to be circulated per ton of refrigeration; tonnage capacities of liquid pipe lines and heat transfer coefficients.

## Mechanics

**MECHANICS OF MATERIALS by Seibert Fairman and Chester C. Cutshall. Size 9 by 6 in.; 420 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price $5.75.**

THE AUTHORS who have many years of teaching experience have prepared a good and clear treatment of the subject. It has been written for the average level of engineering students. Since the book involves calculus, a knowledge of this is recommended.

The book contains many illustrations and examples which promote a better understanding of this study of mechanics. There are over 700 problems which can be used for the application of the theory studied in the book.

The opening section of the book covers stress and strain and includes such topics as Poisson's ratio, stresses in combination of two or more materials, and diagonal shear caused by tension and compression.

Some of the other sections in the book are: riveted and welded joints, including thin cylinders and spheres under pressure; shear and moment in beams; deflection of beams; combined stresses; and strain and energy impact.

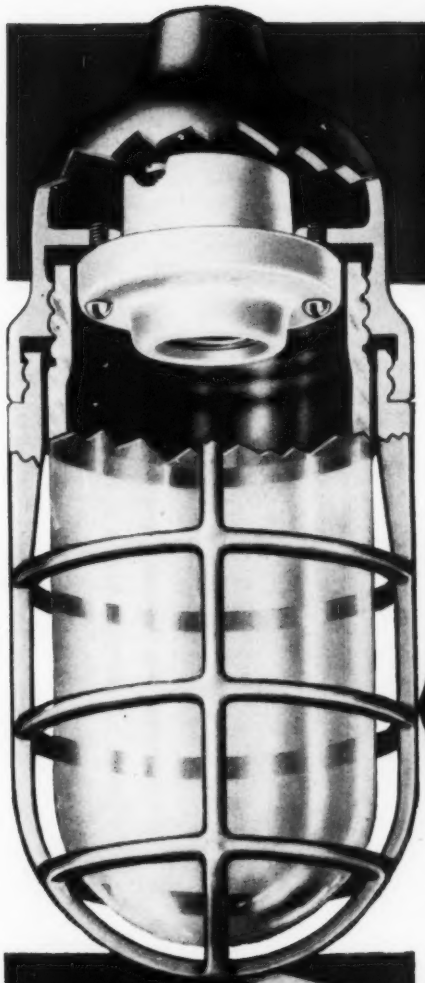
## Controlling Electric Motors

**ELECTRIC CONTROL SYSTEMS by Richard W. Jones. Third Edition. Size 6 by 9 in.; 512 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $7.75.**

ALTHOUGH WRITTEN as an advanced text, this book should prove valuable to industry engineers, in integrating the subjects of machinery, electronics, circuits and transients.

Using both analytical and graphical methods, the author develops the fundamental aspects of relay switching networks, and also considers both relay and electronic counting circuits.

Serving as an introduction to the use of feedback controllers, it cor-



# CROUSE-HINDS

## *Vaportight*

## Industrial Lighting Fixtures

For use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

1. **Vaportight** and raintight.
2. **Wiring chamber** remains vaportight even though globe is off.
3. **Porcelain Receptacle.**
4. **Screw guard** or clamp guard.
5. **11 Hub** arrangements.
6. **4 Reflector** styles.
7. **Accessories:** Colored globes, pear-shaped globes and guards, half shades, and adapters.
8. **4 Sizes:** 50 through 500-Watt.

***Vaportight*** **lighting fixtures are available for attaching to several round-base Condulets and sheet steel outlet boxes. Crouse-Hinds complete *Vaportight* line includes hand lamps, switches, plug receptacles, and other electrical devices.**

**Complete listings in the Condulet Catalog.**

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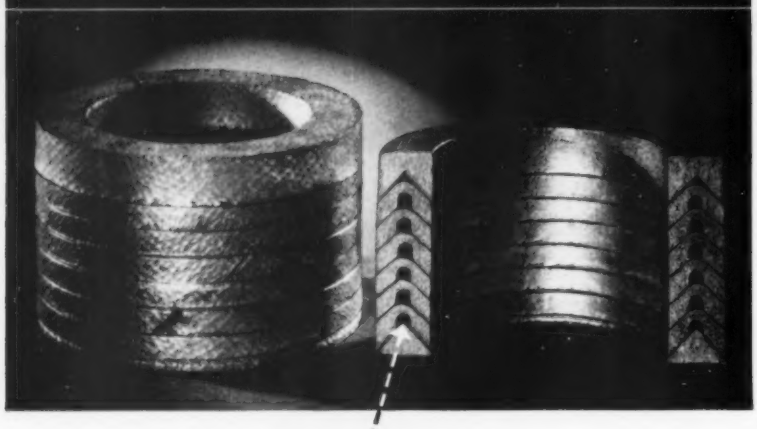
# CHEVRON* PACKING



**Exclusive hinge-like construction assures a positive, low-friction seal**

At every pressure—from the lowest to the highest—Garlock CHEVRON packing provides a positive, low-friction seal. CHEVRON is ideally suited for use on hydraulic cylinders (both single-acting and double-acting), hydraulic rams, plungers of pumps and other reciprocating rods.

The exclusive hinge at the apex of each ring makes this packing flexible and sensitive to pressure changes. When the pressure is on, CHEVRON packing seals firmly both on the inside and outside edges. When the pressure is off, CHEVRON packing maintains a positive seal yet allows the ram or rod to return without binding. This automatic action not only prolongs the life of the packing but also increases the efficiency of the equipment on which it operates.

That is why many manufacturers of hydraulic cylinders, jacks, lifts and presses use Garlock CHEVRON packing exclusively.

Whether your job is plant maintenance or manufacturing new equipment, ask us about CHEVRON packing—the exclusive product of Garlock's own factories. Garlock CHEVRON packing is available in many materials such as: cotton duck with rubber or neoprene binder, asbestos with rubber or neoprene binder, hycar, "Teflon," and "Kel-F."

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*Branch Offices in Most Principal Cities*

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# GARLOCK

**PACKINGS, GASKETS, OIL SEALS,**
**MECHANICAL SEALS, RUBBER EXPANSION JOINTS**

**For more facts circle 602 on Reply Card**


relates their features with those of controllers not equipped with feedback circuits.

By elaborating on the five basic functions of a controller (control of direction, control of torque, control of speed, control of retardation and protection of motors and circuits) the book covers the field of motor controllers with purpose and clarity.

Typical chapter headings include: motor characteristics; gaseous electronic switching devices; basic motor control circuits; feedback control systems and motor protection. Two appendices complete the volume.

## Streamlined Drafting

**SIMPLIFIED DRAFTING PRACTICE by W. L. Healy and A. H. Rau. Size 8½ by 11 in.; 156 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $5.00.**

THIS IS NOT a textbook on engineering drafting. Its purpose, rather, is to arouse the interest of engineering and drafting organizations everywhere in the substantial savings in time and money that can be attained by the adoption and extension of simplified practices.

This book is the result of a brief illustrated booklet which was prepared by General Electric Co. for circulation among the members of their local drafting organization. Because of its popularity, it was decided to make a more extensive study.

Such subjects as freehand drawing, use of symbols, mechanical aids, abbreviations, arrowless dimensioning, legible lettering and tolerances are covered in the various chapters to show where drawings can be simplified.

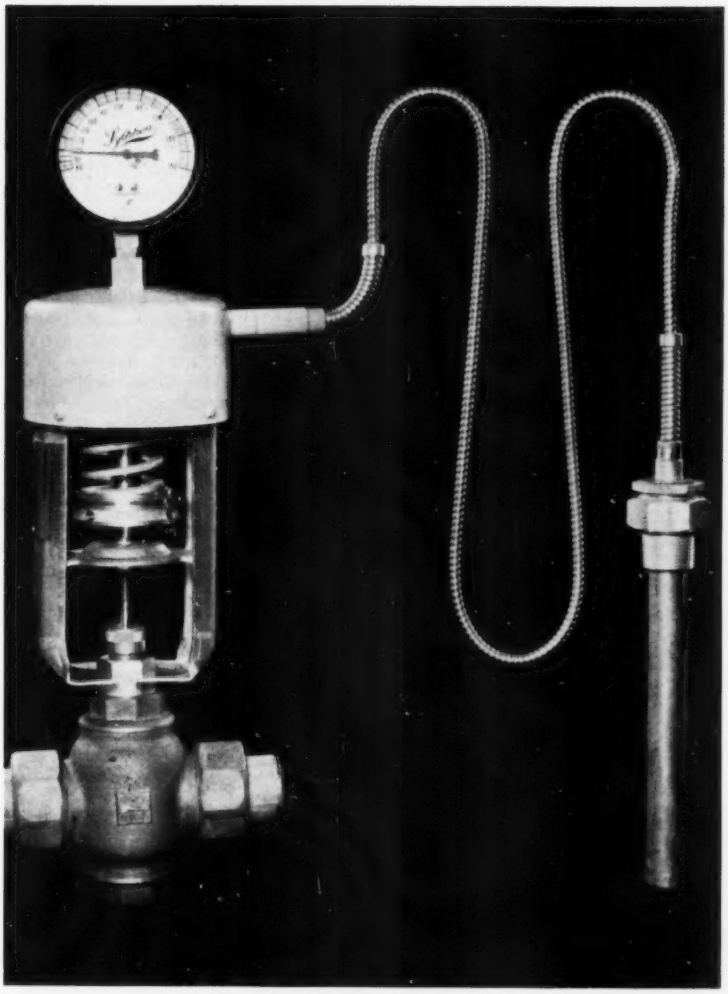
## Taper Standards

**AMERICAN STANDARD MACHINE Tapers, Number ASAB5.10—1953. Self-holding and Steep Taper Series. Size 8½ by 11 in.; paper bound; 16 pp; illustrated. Published by American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N.Y. Price $1.00.**

ALL ENGINEERS who have to be concerned with producing machine tapers, either in production work or in maintenance work, should be aware of the latest edition of these standards. They have gone through a number of tentative drafts, beginning in 1922, and the latest revision is approved as of March 30, 1953.

The standard establishes American Standard Practice for the Slope of Self-holding and Steep machine taper, detailed dimensions for this type of taper tool shank, corresponding dimensions for the taper socket in the spindle of the machine, including the dimensions of key ways.

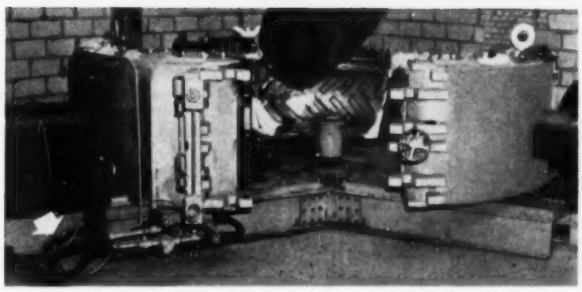
The proper nomenclature is given in the standards, with tables and illustrations of the various taper series and key drives.



# News about flexible metal hose and tubing

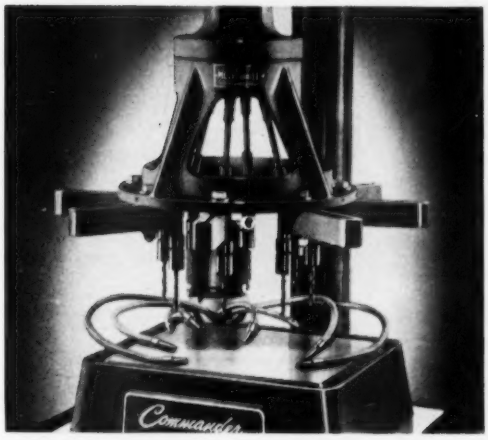
## 3 versatile applications of interest to design, production and maintenance engineers

**PROTECTS DELICATE TUBING** – Fulton Sylphon Division, Robertshaw-Fulton Controls Co., Knoxville, Tenn. uses 7/32 in. and 23/64 in. I.D. American Flexible Brass Hose in this Temperature Regulator. This hose takes sharp bends and installs economically. To protect wiring or flexible shafts, connect moving lines or make assemblies in cramped spaces—design with American Flexible Metal Hose.



**CONVEYS STEAM** – Tire molds need steam – lots of it. At Bacon Vulcanizer Manufacturing Co., Oakland, Calif. American Seamless Flexible Bronze Tubing flexes safely and easily with every opening of the mold. Pressure changes or extreme hot-to-cold temperatures won't swell or collapse it. American has a seamless flexible metal tubing to meet your production requirements for a connector that must move, bend, vibrate or resist heat, cold or pressure.

**WRITE FOR BOOKLET CC-400:** *shows how the tubing is designed, used and installed – gives specifications on tubing and fittings. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*




**DIRECTS COOLANT FLOW** – With this Commander Coolant Table (Commander Mfg. Co., Chicago, Ill.), you can quickly position 8 coolant streams. American Flexible Steel Hose "stays put." Consider this hose both for easily-assembled products and for maintenance requirements.

**wherever connectors must move ... American flexible metal hose and tubing**

**For more facts circle 603 on Reply Card**

ELECTRO DYNAMIC
Extra dependable industrial motors
1 TO 250 HORSEPOWER (N.E.M.A. STANDARDS)
Extra large "free-flo" air channels.
Liberal size grease lubricated bearings.
One-piece cast iron frames.
Permanently aligned cast iron brackets.
Also a complete line of Direct Current motors and generators
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HEART of the motor
3. Extra high-frequency testing of insulation between turns.
4. Extra care in fitting coils into stator.
The WINDING is the
1. Extra insulation in stator slots and between phases.
2. Extra impregnations and bakings of the wound stator.
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WRITE TODAY FOR NEW ILLUSTRATED CATALOGUE NO. 670
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# INDUSTRIAL FILMS

## Story of Lightning

THE PHENOMENA of natural lightning and the development of modern protective equipment is presented in a new 30-minute, color sound film, "Lightning Masters."

Through a series of simple animated drawings, the movie portrays how lightning is generated by nature; how a lightning bolt strikes; and how a lightning arrester works to protect power lines and equipment from damage.

The film also illustrates the various types of lightning protective equipment that are used to protect each segment of a power system from the generating station to the watthour meter.

This film is available from any of General Electric's field offices throughout the country.

## Denison Multipress Featured

"MULTIPRESS AND HOW YOU CAN USE IT," is a 16mm, black and white, 30 minute sound film showing the Denison Multipress at work in various industries with complete description of all the features and operating characteristics. Tooling and production methods are discussed in detail. This film has been shown to over 10,000 production men in the past 2 years and is in constant use.

Denison Engineering Co., Columbus 16, Ohio, or the local representative of the firm will provide information about availability of film.

## Electrostatic Painting Process

A METHOD OF electrostatic painting and its production line applications is shown in a 25 minute, color-sound film, which explains the Ransburg No. 2 process.

Following a brief history of painting methods from the brush to the spray gun, the new, electrostatic atomizer is explained. This is an all-electric, air-less system—no compressed air is used, the paint being atomized by electrostatic force.

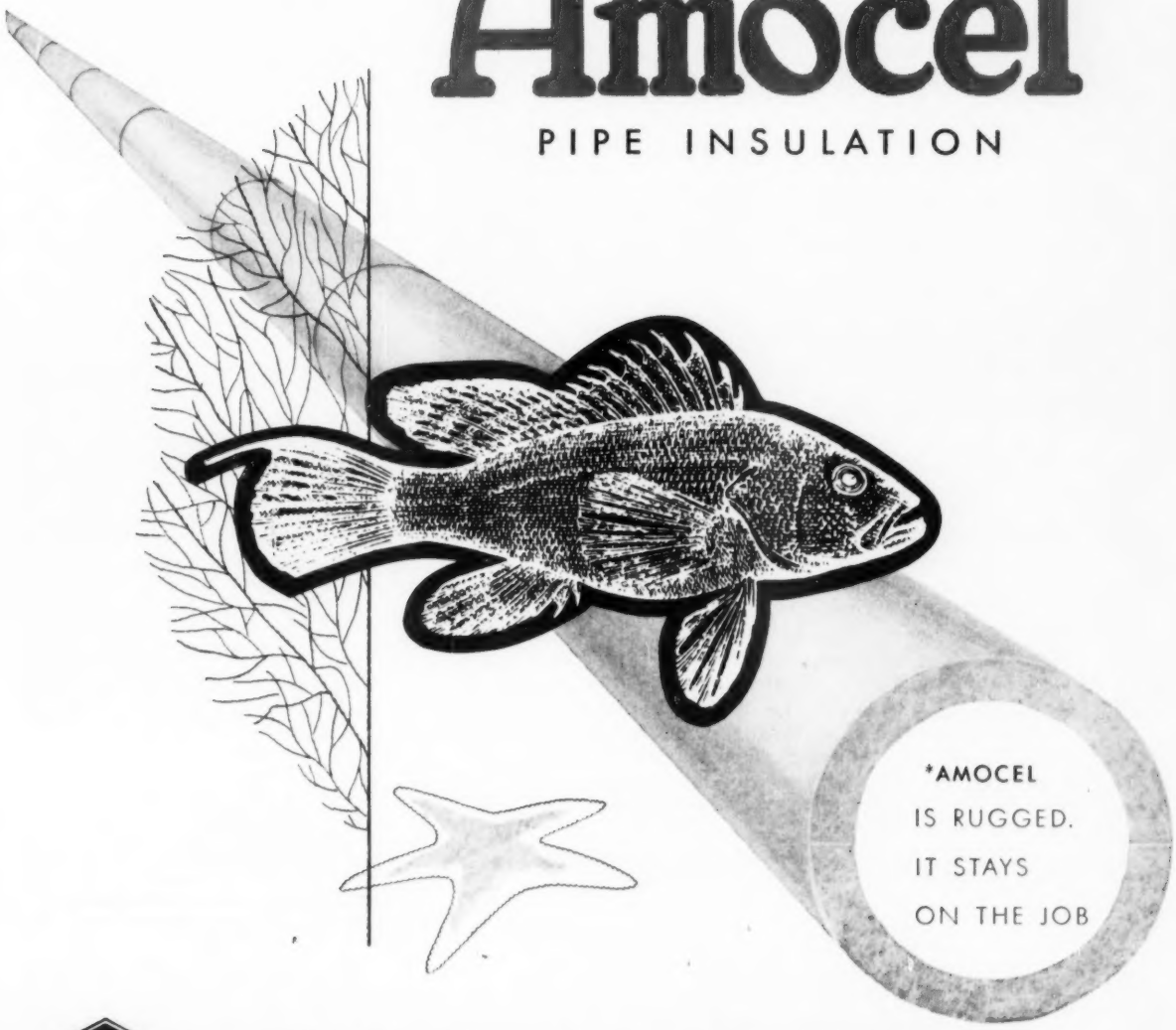
In case history fashion, the film shows how finishing costs—including materials and labor—are substantially decreased while production is increased. A wide variety of applications is included in the plant visits to illustrate the No. 2 Process. For example, the painting of roofing and siding for steel buildings at the rate of 15,000 sq ft per hour is seen and curtain rods, washing machines, metal chairs, auto seat frames and tail pipes, ironing boards, door knobs and many more articles are included in the pictures of factory production lines.

Ransburg's laboratory test facilities are also shown—16 conveyorized

# Unaffected even after weeks under water*

# Amocel®

PIPE INSULATION




UNARCO

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DEPT. J-6, 332 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

**For more facts circle 605 on Reply Card**

# Koiled Kords*

BEFORE

eliminate wire jungles

AFTER

and increase efficiency

*TRADEMARK

"Before and after" pictures courtesy the Miller Company, Meriden, Conn.

Get rid of that tangled, jumbled jungle of inefficient wiring on electrical tools that move. Use Koiled Kords in the plant or on your products and increase efficiency, minimize accident hazards and cut replacement costs.

Koiled Kords are neoprene jacketed electric cords of high quality that are permanently coiled into a spring-like shape which provides for extension and retraction.

Koiled Kords are made with from one to six conductors and may be purchased in mandrel lengths four feet long and used just like straight cords are used. When required Koiled Kords are made to customers' specifications in combination of coiled and straight lengths with or without terminals.

**For specific information for your own application of Koiled Kords write in full detail. Koiled Kords will be glad to work with you.**

Koiled Kords
INCORPORATED

BOX K, HAMDEN, CONN.

IN CANADA: R. D. FLECK AND COMPANY LIMITED, OSHAWA, ONT.

**For more facts circle 606 on Reply Card**


units where new applications are proved for production line installation. Various test units are shown in action on articles ranging from automobile bodies to refrigerator compressors.

The film is available upon request to the Ransburg Electro-Coating Corp., Barth & Sanders Aves., Indianapolis 7, Indiana.

## Investment Casting Process

THE STORY OF how castings were made previously and how they are now made with the Microcast process is presented in the 16mm sound motion picture film, "Microcast — A Story of Industrial Progress."

Information about the availability of this film may be obtained by writing to Movies U.S.A., Inc., 729 Seventh Ave., New York 19, N. Y.

## Working Safely With Electricity

BASIC SAFETY precautions that should be followed to avoid needless injuries and fatalities from electrical shocks when working on electronic equipment are described in a black and white film, "Safety Precautions for Electronics Personnel." Examples of the working habits of various electronic personnel are portrayed to dramatize the need for giving constant attention to one's working surroundings, lighting, tools, safety equipment and so forth.

The film is available from Audio-Visual Aids, Civil Aeronautics Administration, W-153, Washington 25, D. C. Loan of the film is free; transportation and insurance are charged.

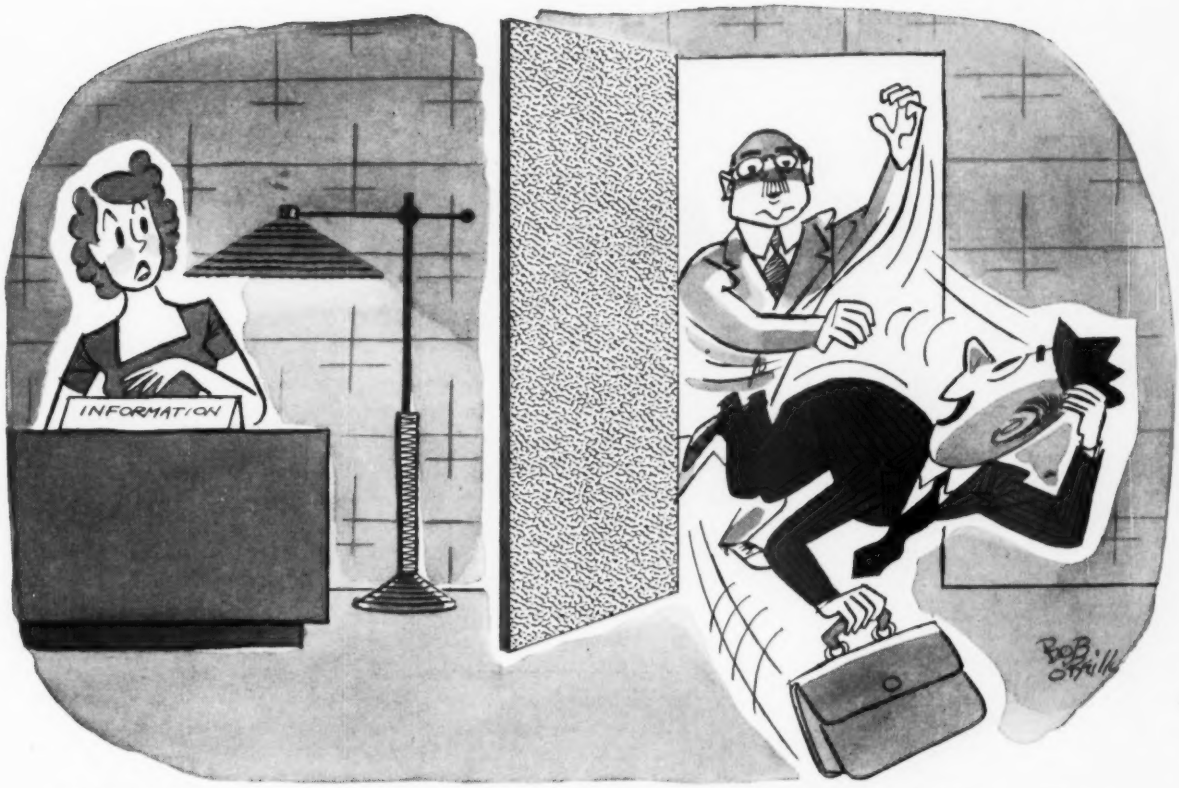
## Precision Sand Casting

A COLOR MOTION picture depicting the high precision and extremely complex parts made possible by modern methods of sand casting in magnesium and aluminum has recently been completed.

Filmed for the R. H. Osbrink Manufacturing Co. of Los Angeles, the motion picture, entitled "Precision Sand Casting by the Osbrink Process," gives a detailed story of the intricate processes involved in developing high-strength, low-weight, castings.

Of particular interest to the engineer is the presentation of advanced weight saving design elements which are an outgrowth of the Osbrink Process. Thin wall castings with minimum or no draft and enhanced metal properties meeting all static test requirements are thus made possible.

The film will be made available for showing to engineering groups, management groups, schools and other interested agencies upon request to the R. H. Osbrink Manufacturing Co., 6917 McKinley Ave., Los Angeles 1, California, to the attention of Mr. C. H. Butler.




*"I'll be back next week, Mr. Grigsby. I'm fascinated with your new Leatherwood door."*

## all through the plant... MASONITE PRESDWOOD solves maintenance problems!

There's a lot of appeal in a flush door faced with Masonite Leatherwood and then painted in tone-on-tone colors. Embossed surface simulates rich-looking Spanish-grain leather.

This is just one of the many ways you can use the helpful family of Masonite Presdwood® Products. Today, all 33 types and thicknesses are hard at work in smoothing out production problems... as well as giving a bright new look to reception rooms, offices, halls and washrooms.

We've prepared an illustrated booklet showing how these all-wood hardboards can help speed the work in plants of all kinds. Mail the coupon for your free copy.

**BETTER HARDBOARDS FOR BETTER MAINTENANCE**

***Sold through building materials dealers***

**MASONITE® CORPORATION**
**Dept. PE-6, Box 777, Chicago 90, Ill.**

Please send me your free booklet on "How to Improve Factory Methods with Masonite Presdwood."

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*City*.....*Zone*.....

*County*.....*State*.....

"Masonite" signifies that Masonite Corporation is the source of the product

**For more facts circle 607 on Reply Card**

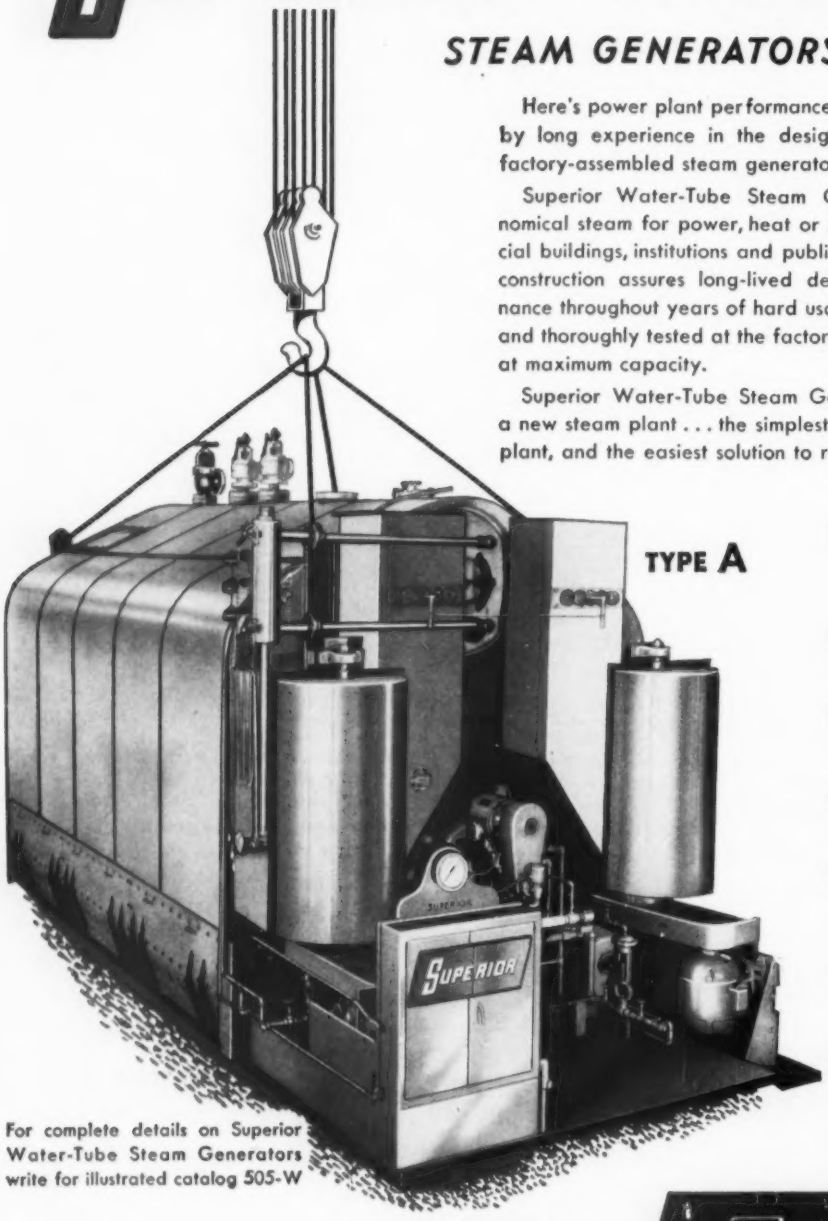
# SUPERIOR WATER-TUBE

## STEAM GENERATORS

Here's power plant performance in a compact package . . . backed by long experience in the design and manufacture of completely factory-assembled steam generators.

Superior Water-Tube Steam Generators provide efficient, economical steam for power, heat or process in industrial plants, commercial buildings, institutions and public utilities. Their rugged, heavy-duty construction assures long-lived dependability and minimum maintenance throughout years of hard usage. Each unit is ***performance rated*** and thoroughly tested at the factory to insure high efficiency operation at maximum capacity.

Superior Water-Tube Steam Generators are the ideal choice for a new steam plant . . . the simplest answer to expanding your present plant, and the easiest solution to replacing obsolete boilers.

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For complete details on Superior Water-Tube Steam Generators write for illustrated catalog 505-W

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5. Efficient type "A" symmetrical tube arrangement for quick steaming, even evaporation, and ease of maintenance.
6. Burns any grade of oil or gas. Unobstructed fire box floor provides for installation of stoker.
7. Built-in multiple induced draft fans provide cleaner, quieter, safer operation; eliminate need of expensive chimney.

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SUPERIOR STEAM GENERATORS

**For more facts circle 608 on Reply Card**

(Continued from page 36)

## PUMPS, COMPRESSORS

**131 Centrifugal Pumps**—Bulletin WQ-214 introduces manufacturer's new Type DF, an end-suction, centrifugal pump in capacities to 1000 gpm, heads to 400 ft. It is adapted to pumping water, condensate, solvents, brines, caustics, organic liquids, hydrocarbons, gasoline, oils. Bulletin illustrates design features; includes dimensions. Warren Steam Pump Co., Inc.

**132 Hydraulic Pumps, Motors**—This data book (approx. 30 pp) describes a new line of heavy duty oil hydraulic pumps, motors and transmissions, providing performance data on dimensional drawings. The line includes variable delivery pumps, variable speed transmissions, and both constant displacement and variable displacement pumps, units particularly adapted to heavy machinery drives requiring precise control of acceleration, speed, reversal. Waterbury Tool Div., Vickers, Inc.

**133 Compressors, Pumps**—Catalog 548, 6 pp, presents company's line of air and gas compressors, Oilfreair and Oilfregas compressors, dry vacuum pumps, aftercoolers, Airchek valves, and centrifugal pumps for boiler feeding and general applications. Includes brief descriptive data along with illustrations; also capacities and sizes. Pennsylvania Pump and Compressor Co.

## METALS

**134 Stainless Steel Bars**—This new 28-pp booklet is offered to aid plant engineers in the selection of the proper stainless steel material for the job at hand. Provides properties, reference tables on sizes and shapes available, weights and corrosion resistance. Includes a section of fabrication and processing information covering cutting, welding, forging, upsetting, machining, drilling, reaming, threading, turning, heat treating, other operations. Allegheny Ludlum Steel Corp.

**135 Alloy Spring Steels**—Illustrated with charts, tables and photo-micrographs, this 18-pp technical paper compares the mechanical properties of three alloy steels—chromium-nickel-molybdenum, chromium vanadium, and silico manganese—with plain carbon spring steel. Covers requirements for hot-rolled spring steels, test procedure and results obtained. The International Nickel Co., Inc.

**136 Tubing Steel for High Temp Service**—An alloy tubing steel for elevated temperature service is discussed in Technical Data Card 146. The steel is company's Croloy 5 (4 to 6 per cent chromium, ½ per cent molybdenum) in use in refinery and process industry applications and said to be particularly resistant to corrosion from hot oil, hydrogen sulfide, elementary sulfur and sulfur compounds. Bulletin includes data on properties, creep strength, fabrication. The Tubular Products Div., The Babcock & Wilcox Co.

## TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

**137 Plumbers, Steamfitters' Tools**—Catalog 353, 12-pp, describes and illustrates a complete line of tools for plumbers, steamfitters and machinists. Provides complete technical data, and includes price list. Covers wrenches, pipe vises, threaders and cutters, bar vises. The Erie Tool Works.

**138 Machine Tool Guide**—Now available to qualified plant engineers is this 180-pp catalog covering domestic and European machine tools, also tools for turret lathes, and accessories. Providing illustrations, application suggestions and specifications, various sections of catalog are devoted to manufacturer's own line and other domestic makes, foreign-made machine tools, used and rebuilt machine tools. Also gives details on tool rebuilding service, engineering services, and plant liquidations. Please state your title when requesting this book. Morey Machinery Corp., Inc.

**139 Rotary Files, Ground Cutters**—Bulletin 57 offers 12 pp of selection and application information on a line of rotary files, high speed steel ground cutters and carbide tools. Compiled for easy selection of right file, cutter, end mill or grinding burr for use with flexible shaft machines, portable tools and precision high speed machine tools. Includes chart of recommended operating speeds, dimensions. This is a valuable reference for plant engineers concerned with finishing castings, metal patterns, dies, molds or performing of countersinking and deburring operations. R. G. Haskins Co.

**140 A-C Welding Equipment**—Three basic a-c welding machines and their accessories are appraised in 17-pp Booklet B-5622. Shows how (1) a general purpose unit, (2) a 200-amp welder with built-in high frequency stabilizer, and (3) a general and special purpose 80-v machine can provide the answers to practically any a-c welding problem. It also tells of savings in production time, power, maintenance afforded through the use of a-c welders. Each type is described as to construction, operation and application. Electrical specifications, dimensions and weights are given. Westinghouse Electric Corp.

**141 Resistance Welding**—The how, what and why of resistance welding is described in 16-pp Bulletin GEA-5816. Explains what metals are suitable, essential steps in making a weld and principal types, including spot, seam, projection and butt welds. Basic components of electronic controls for regulating heat and timing are explained and illustrated. Pictures and descriptions of accessories, along with a list of applications for this type of welding are included. General Electric Co.

**142 Machinery Mounts**—This 8-pp brochure describes company's Vibraglass, glass fiber shock and vibration absorbing machinery pads. Data on physical and chemical properties, along with performance charts and graphs are given for this highly resilient board material. Glass Fibers Inc.

**143 Improved Cutting Oils**—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty and heavy duty operations on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain active-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

**144 Metal-Cutting Guides**—Bulletin 101 describes and pictures guides for hand-held cutting torches. Tells how guides are quickly attached to torches and provide a means for fast, accurate cutting of circles, straight lines, angles, bevels. Shows three types: a small circle guide, a large circle guide, and a straight-line guide. Includes prices. New Era Engineering Co.

## SAFETY

**145 Static Alarm Systems**—Here's an illustrated report titled, "New Static Alarms—Fire Protection for Industry," describing a system in use at a U. S. Navy ammunition depot. Outlines problem of preventing explosions and fires, tells of installation which warns of presence of static and explains its operation. The John Hewson Co.

**146 Adequate Protection?**—This illustrated 12-pp booklet tells how to determine

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whether current actuated protective devices are really protecting. Explains importance of such current actuated protective devices as overload relays and circuit breakers, and gives step-by-step instructions for testing and calibrating them. Multi-Amp Corp.

## ENGINES

**147 Engine Maintenance Manual**—Form 30562, 24 pp, latest of this company's cartoon-type instruction booklets, shows proper operation and care required for four large V-type diesel engines. Provides a "conversational" discussion of the maintenance of these engines, along with easily-understood diagrams and other illustrations. Caterpillar Tractor Co.

**148 New Engine Developments**—Bulletin S-500-B55, 12 pp, presents new developments in oil diesel, dual fuel diesel and high compression spark ignition engines. Describes up-to-date features of modern, economical, heavy duty, internal combustion engines. Includes a heat balance chart showing waste heat recoverable from exhaust gases and jacket cooling water, and is accompanied by fuel cost charts for determining most economical type and descriptions of industrial and municipal installations utilizing heat recovery systems. Engine Div., Worthington Corp.

**149 Where to Use Diesel Electric Sets**—Form 30658, 8 pp, titled, "Power," explains efficient and economical use of diesel electric sets in many industries. Thirteen pictures show their versatility in industrial and other installations, and their use as emergency stand-by power in hospitals and public utilities is also discussed. Booklet charts 12 sizes of company's electric sets and output for continuous and intermittent use. Caterpillar Tractor Co.

## MAINTENANCE

**150 Rugged Resurfacer**—An iron-asphalt patching material for long life repairs and easy, fast patching or resurfacing of worn floors is described in Form MC-4. According to bulletin this material, Masterquick, overcomes problem of early breakdown under impact, particularly of feather edges. Gives illustrated directions for use. The Master Builders Co.

**151 Sump Cleaning**—The use of vacuum equipment in sump cleaning is described and pictured in Bulletin 130-C. This equipment can pick up liquids at the rate of 40 gpm, with a tank capacity of 125 gal. Improved equipment for picking up water from floors and ducts is also presented. The Spencer Turbine Co.

## PLASTICS

**152 Data on Polyester Film**—Fourteen-pp Technical Bulletin 1-2-53 gives up-to-date information on physical, electrical and chemical properties of Mylar polyester film along with suggested applications for this material, now being produced only for market development purposes. Compares properties of Mylar with those of cellophane, polyethylene, acetate. Film Department, E. I. du Pont de Nemours & Co.

**153 Plastic Sheet Material**—The physical properties uses of Homalite CR-30, a clear thermosetting plastic sheet, are given in Bulletin 1052. Also gives photographic report on a welding spatter test conducted on this plastic, and describes treatment with a mirroring material for industrial mirrors. The Homalite Corp.

**154 Mechanical Plastics Deflashing**—Bulletin 934, 6 pp, tells how to deflash plastics quickly and economically with automatic airless blasting equipment. Gives seven advantages of the method and explains how it makes deflashing a mass production operation. American Wheelabrator & Equipment Corp.

**155 For Better Injection Molding**—What the experts say about the effects of mold temperature control on injection molding cycles is told in 8-pp Technical Bulletin 7. The answers to ten pertinent questions are given in detail along with a chart listing mold difficulties occurring with various thermoplastics when molding temperatures are wrong. Also provided is an illustrated question-and-answer discussion of company's mold heating and cooling unit. Sarco Co.

## HEATERS

**156 Industrial Heaters**—Catalog 1510, 32 pp, presents company's standard and heavy-duty centrifugal fan industrial heaters for manufacturing bays, warehouses and other large areas. Information on where to use the heaters, at what circulating capacities and temperatures, and how to place them is given. Automatic temperature control is explained, and how to estimate heat loads is told. Typical specifications and examples are provided, and tables and graphs of performance data included to aid in selection. Also included are dimensions, construction features, installation instructions. Sturtevant Div., Westinghouse Electric Corp.

**157 Suspended Space Heaters**—Bulletin 542, 6 pp, shows a new line of suspended space heaters for use with any type of gas fuel. Provides specification data with dimensions and capacities of both propeller fan and blower type units with output capacities ranging from 70,000 to 175,000 Btu per hour. Tells applications for heating, ventilating and process drying, with or without ductwork. Dravo Corp.

## BOILERS

**158 Automatic Boilers**—In addition to providing detailed engineering data and specifications, Form 102 also discusses the features and advantages of manufacturer's automatic boilers, ranging from 10 to 800 hp. Boiler Engineering & Supply Co.

**159 Steam Boiler Units**—Eight-pp Bulletin 508 describes complete boiler units designed for oil or gas or combination firing. Discusses important features of these factory built units, pictures 17 installations. Johnston Brothers, Inc.

## MECHANICAL POWER TRANSMISSION

**160 Hydraulic Cylinders**—Bulletin 701, 28 pp, presents a line of hydraulic cylinders offering dependability and ruggedness. Explains design advantages of the line and gives mounting data and capacities of cylinders for working pressures up to 1500 psi and those for working pressures to 5000 psi. Lindberg Engineering Co.

**161 Roller Bearings**—Bulletin 200-C, 28 pp, a recently revised catalog on self-aligning spherical roller bearings, includes a new width tolerance chart; provides more complete thread, locknut and washer data; a revised interchangeability chart; and has been reorganized for easier reference particularly where adapter type assemblies are concerned. Includes such engineering data as life expectancy, capacity ratings. The Torrington Co.

**162 Square Design Cylinders**—Illustrated 8-pp Bulletin H-104C gives engineering, design, construction, mounting and dimensional data on a line of space-saving square-design hydraulic cylinders for 2000-3000 psi operation. Arrangement of this data permits quick selection of desired model and bore size and the obtaining of complete mounting and dimensions for model selected. Bulletin covers 13 mounting styles. Miller Motor Co.


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**163 Space-Saving Cylinders**—A new line of space-saving high-pressure hydraulic cylinders is shown in 10-pp Catalog 103. Presents 11 different models, each available in 11 bore sizes. A dimension drawing of each model refers to a time-saving table of dimensions which folds out so that it is adjacent to any page being used. Also included is extensive pressure and flow data in tabular form. The S-P Mfg. Corp.

## OTHER EQUIPMENT

**164 Defect Detection Methods**—Equipment and products for non-destructive inspection and testing of a wide range of materials are presented in Form 147-1, a 16-pp brochure. Discusses company's Magnaflux and Magnaglo methods for inspection of magnetic materials; Zyglo, fluorescent penetrant inspection method for non-magnetic solids; Statiflux, for locating defects in non-conductive, non-porous materials; and Partek, filtered particle inspection for ceramics and porous solids. Also described are the Sonizon method of measuring thickness by sound, and Stresscoat, a coating for simplifying stress analysis. Magnaflux Corp.

**165 Carbide Dies**—Thirty-pp Catalog D-130 describing a complete line of carbide dies includes a new list of header die nibs and special information on wire flattening rolls, welding rod coating dies, and capstan rings. Also contains a standard wire gage table, split gage table in decimal sizes and a table of decimal equivalents. Carboloy Dept., General Electric Co.

**166 Corrosion-Resistant Equipment**—A 64-pp booklet on the selection and use of this manufacturer's corrosion resistant equipment, Bulletin F-6, is made available to qualified plant engineers. Gives general information on the various grades of Haveg, properties, design principles, and surface finishes. Describes and pictures standard pipe, fittings, valves, pumps, fume systems, tanks, towers, pressure and vacuum equipment, and other equipment. Also describes Haveg cements. Haveg Corp.

**167 Rubber Linings**—This 8-pp illustrated bulletin tells advantages and application of rubber lining to steel tanks, drums, pipes, valves, fittings and pumps. Includes tables giving resistance characteristics of company's rubber lining to inorganic acids, salts and alkalies, organic materials, other materials. Details on chemical, abrasive and temperature resistant qualities of rubber linings and different types available are included. Protective Coatings Div., Metalweld, Inc.

**168 Self-Locking Nuts**—Form 866 on company's Flexloc nuts explains what they are, how they work and what they do, illustrating their design principle and showing some of their applications. Gives sizes of regular height, thin nut, external wrenching and clinch nut types. Standard Pressed Steel Co.

**169 Analysis of a Lubricant**—Titled, "Properties and Uses of Pure Molybdenum Disulfide as a Lubricant," this paper is described as one of the most complete technical discourses on the lubricating qualities of this compound. Covers its chemical stability, electrical properties, purity, anti-corrosion properties, thermal stability, coefficient of friction and methods of application. The Alpha Corp.

**170 Ion-Exchange Softener**—Duolite Data Leaflet 24, 24 pp, presents Chempro C-20, a polystyrene cation exchange resin, describing the technical aspects of a common use of an ion-exchange resin. Covers such subjects as hardness to sodium ratio, its influence on capacity; effect of magnesium-calcium ratio on capacity; concentration of regenerant brine; contact time; regeneration and rinse rates; exhaustion flow rate; bed depth; turbidity; upflow softening and regeneration; regeneration with sea water, with natural brines. Chemical Process Co.

**171 Blast Cleaning Hose Machines**—Bulletin 100A, 28 pp, points out that, in spite of advances in automatic equipment and airless blast cleaning, there are some jobs best accomplished by hand-operated nozzle blast cleaning equipment. Two fundamental methods of applying the abrasive, direct pressure and suction, are described as well as the applications of both wet and soft abrasives. Tables show relationship between orifice area and circumference in nozzle sizes and air flow with required horsepower to develop air jets of varying diameters. Pangborn Corp.

**172 Figure Facts in Print**—How the chore of finding percentages, essential to many statistical operations, is reduced to its simplest form by means of manufacturer's printing calculator is told in Booklet AC 639, illustrated. Calculator is designed for automatic clearance so user can go on to next calculation without copying a recalculation. Remington Rand Inc.

**173 Complete Finishing Systems**—This 16-pp catalog pictures and describes a variety of finishing systems and equipment, covering both self-contained systems and unitized types. Processes outlined include pre-treatment, paint application, drying, and replacing plant air exhausted by these operations. Installation examples presented. Cincinnati Cleaning & Finishing Machinery Co.

**174 Mobile Two-Way Radio Equipment**—Outstanding features of a mobile transmitter and receiver are discussed in Bulletin B-656. Includes nominal performance specifications. Motorola, Inc.

**175 To Get the Jump on Weeds**—Four weed control products and their applications are presented in this folder. They include a non-selective weed killer for low cost destruction of all vegetation; a product for selective extermination of tough species; a dual-purpose type for use where there is danger of spray drift injuring adjacent vegetation, and a liquid for control of weeds without injury to most grasses. Brulin & Co., Inc.

**176 For Overseas Shipping**—"Export Packing" is a 20-pp brochure prepared for manufacturers who ship products to overseas customers, to assure safe delivery of goods through proper use of shipping containers. Booklet analyzes goods to be shipped in the light of protection required, covers box or crate specifications and marking procedures. Includes glossary of terms and list of government specifications. National Wooden Box Association.

# DATA FILE of literature for the plant library

**STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 35-36 and 169-170.**

## MAINTENANCE

**201 Basic Roofing Information**—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

**202 Maintenance Manual**—"Over the Rough Spots" is a 48-pp pocket size booklet giving the answer to practically every repair or building maintenance problem. Tells how to patch holes and resurface floors, how to prevent water seepage in underground foundations, repair leaky roofs, preserve concrete or wood surfaces, protect structural steel from rusting, and gives many time and labor saving methods. Generously illustrated. Stonhard Co.

**203 Protective Paints**—Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for use on wood, metal surfaces. Cellulose Products Dept., Hercules Powder Co.

**204 Tar Base Coatings**—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corrosive conditions; and a coating formulated for water tank interiors. Pittsburgh Coke & Chemical Co.

**205 Building Maintenance**—Handbook 7 offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

**206 Roofing Manual**—Engineering data on roofing is given in Roofing Specifications Book, 32 pp. Covers coal-tar pitch roofing, waterproofing, dampproofing, roof insulation, flashings. Contains illustrations. Tar Products Div., Koppers Co., Inc.

**207 Iron Cement Handbook**—This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

**208 Power Brushes**—Bulletin C-269, describing company's new power brushes, pictures their design. The Osborn Mfg. Co.

**209 Proper Care of Floors**—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well-written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, cork, tile, linoleum, mastic wood. West Disinfecting Co.

**210 Vacuum of Many Jobs**—Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

**211 Floor Scarifier**—Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. G. H. Tennant Co.

**212 For the Overhead Jobs**—Scaffolds designed to make overhead work safer and easier are described in 16-pp Form 10-852. Illustrates and discusses adjustability, large working platform, easy assembly, self-locking trusses and other advantages. Shows how they are readily stacked for height. Baker-Roos, Inc.

**213 Blower-Suction Cleaner**—Data on a portable combination blower-suction cleaner for cleaning machinery, motors, stock bins is offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

## CONSTRUCTION

**214 Glass Block Fenestration**—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft and ventilation below window sill. Test data is summarized and recommendations included. Although test was conducted on glass block fenestration in school buildings, the information will be of interest to those concerned with industrial applications of glass block. Kimble Glass Co.

# WHICH POWER TYPE IS BEST FOR YOU?

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# DATA FILE

(Begins on page 171)

**215 Industrial Steel Windows**—Planned to offer comprehensive easy-to-find data, this 24-pp catalog gives descriptions, specifications, sizes, uses and advantages of Fenestra pivoted windows, commercial projected windows, and security windows used separately and in combination, also continuous windows used mainly for top-lighting in monitor and sawtooth roof construction. Detroit Steel Products Co.

**216 Heat Absorbing Glass**—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating and maintenance costs. Mississippi Glass Co.

**217 Technical Manual on Plywood**—Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

**218 How Hardboards Improve Methods**—Twelve-pp Form 5202, on production economies in plant maintenance, materials handling and processing, enumerates applications and specifies types and thicknesses of company's Presdwood for specific purposes. Lists 28 advantages of Presdwood, describes its use in architectural applications, bins, utility boards, cabinetwork, containers, booths and ventilators, work surfaces. Masonite Corp.

**219 Metal Framing Guide**—Although pocket-sized, 80-pp Catalog 800 is packed with illustrated information on an all-purpose metal framing system, and serves as a handy reference text. Fully indexed, shows the versatile basic channel, suggests possible combinations and pictures typical fittings and parts. Provides design and application data and pictures some of the almost unlimited uses for this framing system. Includes reference tables. Available to qualified plant engineers. Unistrut Products Co.

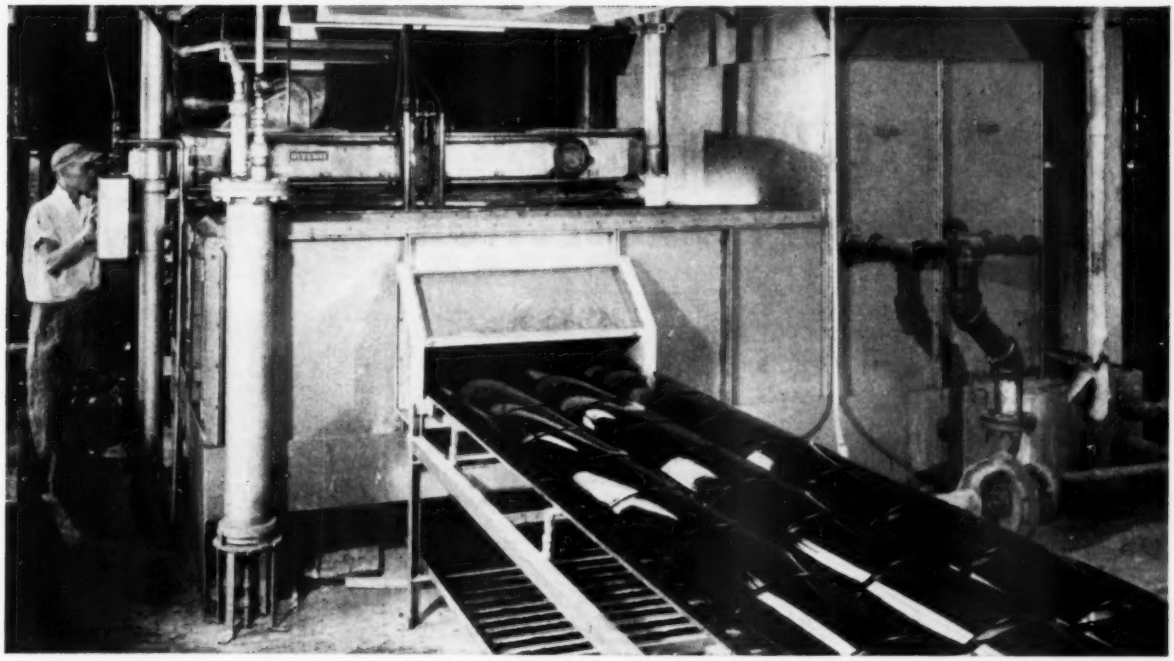
**220 Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Pictures some applications. Alan Wood Steel Co.

## TOOLS, WELDING

**221 Idea Book**—Sixty pages of "1001 Shortcuts" for production, construction and maintenance make this hand-tool and hydraulic-tool handbook one of the most useful ever. Large photos and concise descriptions give ideas developed and successfully applied by hundreds of tool users. One of the big values attached to the "Idea Book" comes from the manner in which it stimulates the user to create his own ideas. Typical job photos suggest the general principles of the applications. Blackhawk Mfg. Co.

**222 Pipe Tool Book**—This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

**223 Resistance Welding**—Featured in this 24-pp catalog are newly-designed tips and holders recently added to company's equipment. Full information is also given about other holders, tips, seam welder wheels and shafts, and bushings, in



Bissell Carpet Sweeper Company applies sales appeal to 1200 metal tops for carpet sweepers per hour with a DeVilbiss automatic horizontal transverse machine. It saves coating material, reduces scrap loss, gives a better looking job.

# DeVilbiss automatic spraying cuts painting costs 2/3 at Bissell!

**Three men now handle the work of nine. And rejects are negligible since Bissell put in DeVilbiss automatic spray-painting equipment.**

Production requirements at Bissell Carpet Sweeper Company, Grand Rapids, Michigan, call for 1200 painted metal tops per hour for carpet sweepers.

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How about *your* company? Is there a job out in the shop that could benefit from the high speed, the smooth and uniform finishes brought by DeVilbiss automatic spray-painting equipment? Whether you're working with flat parts, parts traveling on overhead conveyors or parts that require both inner and outer coatings, you'll find DeVilbiss has a wide variety of machines to serve you.

Your local DeVilbiss representative can give you full details on DeVilbiss automatic spray-painting equipment as well as DeVilbiss spray guns, air compressors, hose and connections. Why not make a note to call him while it's still fresh in your mind?

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This DeVilbiss rotary-type machine is ideal for finishing a wide range of small, symmetrical parts. Available with 24"- or 36"-diameter table, 12 to 36 spindles; handles 660 to 5400 pieces per hour depending on job conditions. Larger model also available.

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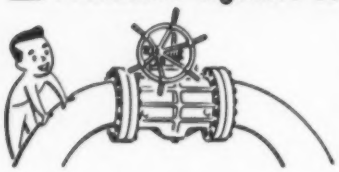
# The Nordstrom Principle of *Lubrication* gives this 4-WAY PROTECTION

## 1 Protection Against Leakage

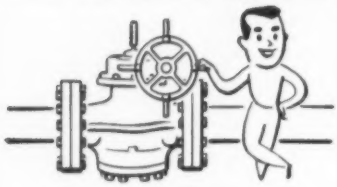


In a Nordstrom valve, lubricant-filled grooves completely surround seat ports providing a positive seal which prevents leakage whether the valve is open or closed.

## 2 Protection Against Abrasion

A film of lubricant protects contact surfaces of a Nordstrom valve from abrasion when it is operated. This wear-resisting feature means Nordstroms operate at a constant high level of efficiency over a much longer period of time.

## 3 Protection Against Sticking Tight in Service



Because the plug rotates within the body on a film of lubricant, a Nordstrom valve operates easily and quickly at any time . . . an important feature in case of emergency.

## 4 Protection Against Corrosion

Corrosive or erosive services cannot wear away the vital seating areas of a Nordstrom valve because, protected by a film of lubricant, *the seat is never exposed to the line fluid.*

Only Nordstrom Lubricant-Sealed valves are protected in these four ways. Bulletin V-217 describes Nordstrom valves for industrial uses. Mail the coupon for your copy.

**ROCKWELL Built**
**NORDSTROM VALVES**
*Lubricant-Sealed for Positive Shut-Off*

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Rockwell Manufacturing Company N 5320A
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Pittsburgh 8, Pa.
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Company_____
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_____ (City) (Zone) (State)

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# DATA FILE

(Begins on page 171)

manufacturer's line, as well as flash, butt, barrel and projection welding dies. Ampco Metal, Inc.

**224 Stud Driver**—Special operating features of company's Model 450, a self-powered quick fastening tool, are detailed in Form 937A. Photos show how the driver is used and picture it in action. Industrial Tool Div., Remington Arms Co., Inc.

**225 Powerful Puller**—Introduced in Bulletin 97-A is the compact Power-Twin, a fast-working hydraulic ram. Shows how this ram, with its center hole feature, can convert all of company's pulling systems to hydraulic push, pull or lift operation. Owatonna Tool Co.

**226 For Faster Fastening**—Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

## VENTILATING, DEHUMIDIFYING, AIR CONDITIONING

**227 Air Conditioning Cabinets**—Engineering Bulletin 3703A, 40 pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling sions and specifications. Walworth Co.

**228 Improved Air Conditioning**—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

**229 How Conditioning Units Can Help**—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

**230 Putting Air to Work**—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

**231 Fans and Blowers**—Illustrated Catalog 21A, 64 pp, gives ordering information on company's fans, blowers, roof ventilators and related products, including application suggestions, ratings, dimensions. Explains principle of curved orifice air-seal ring incorporated. Provides directions for installation and operations, maintenance and lubrication. Hartzell Propeller Fan Co.

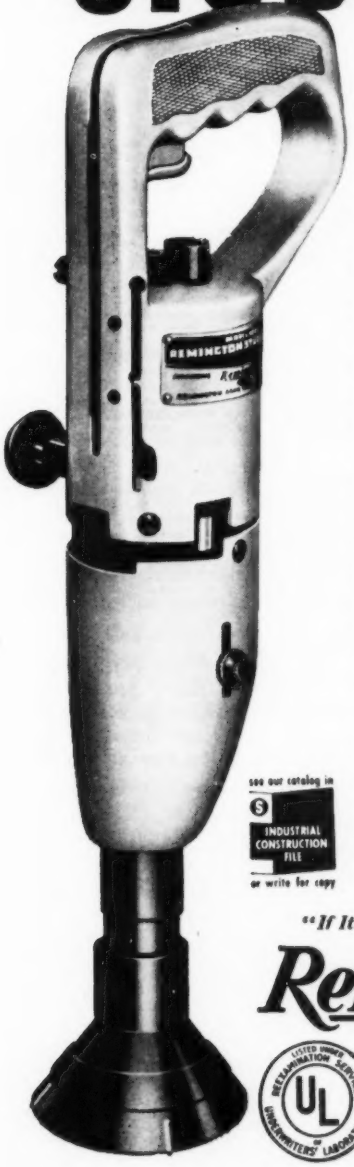
**232 Heating, Air Conditioning Book**—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

**233 Push-Button Ventilation**—Six-pp Bulletin 680 gives sizes, dimensions and performance data on power roof ventilators for flat, curved or peak roof installations, capacities to 78,800 cfm. Cites advantages of ventilation by positive air displacement. Propellair Div., Robbins & Myers, Inc.

**234 Vaneaxial Fans**—Bulletin J-611 is a 16-pp booklet presenting company's Axi-

*Widest power range of any powder-actuated fastening tool*

# MODEL 450 REMINGTON STUD DRIVER



see our catalog in 9 INDUSTRIAL CONSTRUCTION FILE or write for copy

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Each of the six power loads for the Remington Stud Driver is designed to give the right power for the job—whether it's driving the stud into concrete or steel.

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But exceptional power range is just one of the Remington Stud Driver's many advantages. This self-powered tool sets up to 5 fastening studs per minute . . . speeds construction jobs and cuts costs. Its light weight—only 5½ pounds—makes handling easy, even in confined places.

Test proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by the Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.* Send in the coupon below for your free booklet describing the Stud Driver and its many uses.

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Anchoring wood sleepers to concrete

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# DATA FILE

(Begins on page 171)

vane Series 1000 fans. Explains advantages of vaneaxial design and the versatility afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia., volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

**235 Roof Ventilators, Louvers**—Now available to qualified plant engineers is a collection of literature on gravity and powered proof ventilators and ventilating louvers. Includes a résumé of engineering helps for working out a ventilating problem—a guide for estimating ventilating requirements, installation procedures, sizes and capacities. The Swartwout Co.

## HEATING, COOLING

**236 Engineering Data for Heating Systems**—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

**237 Forced Air Space Heaters**—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principle and flexibility of application. Advantages of the heaters compared with other types of heating units are detailed. These heaters are direct fired by oil, gas or combination fuels. Dravo Corp.

**238 Electric Heaters**—Bulletin E-1, 8 pp, describes electric unit heaters and heater sections for general industrial heating as well as for specialized use in heating corners of factories, warehouses. Illustrates overhead downward discharge heaters with revolving and stationary discharge outlets and a heater with horizontal discharge. An electric duct heater section is also described. L. J. Wing Mfg. Co.

**239 Heat-on-Wheels for Industry**—Illustrated Form 3574, 16 pp, is the story of how manufacturer's portable heaters can solve emergency heating problems. Shows how these heaters provide extra heat for the hard-to-heat spots, and for extra cold areas, to spot heat where needed, and for ventilating, drying and thawing jobs. Herman Nelson Div., American Air Filter Co., Inc.

**240 Faster Tank Heating, Cooling**—Bulletin IP-250, 8 pp, describes company's Platecoils, embossed metal sheets welded to form compact units through which required heating, or cooling, medium is circulated under pressure. Explains lower costs, faster tank cooling or heating, lighter weight and compactness of these units. Kold-Hold Mfg. Co.

**241 Industrial Dry Coolers**—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

## DUST CONTROL

**242 Dust Control**—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

**243 Dust Control Technology**—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

**You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of the ad.**

**244 Manual of Exhaust Hood Design**—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

**245 Dust Recovery**—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

**246 Dust Control Brochure**—Dust and fume control in many industries is the

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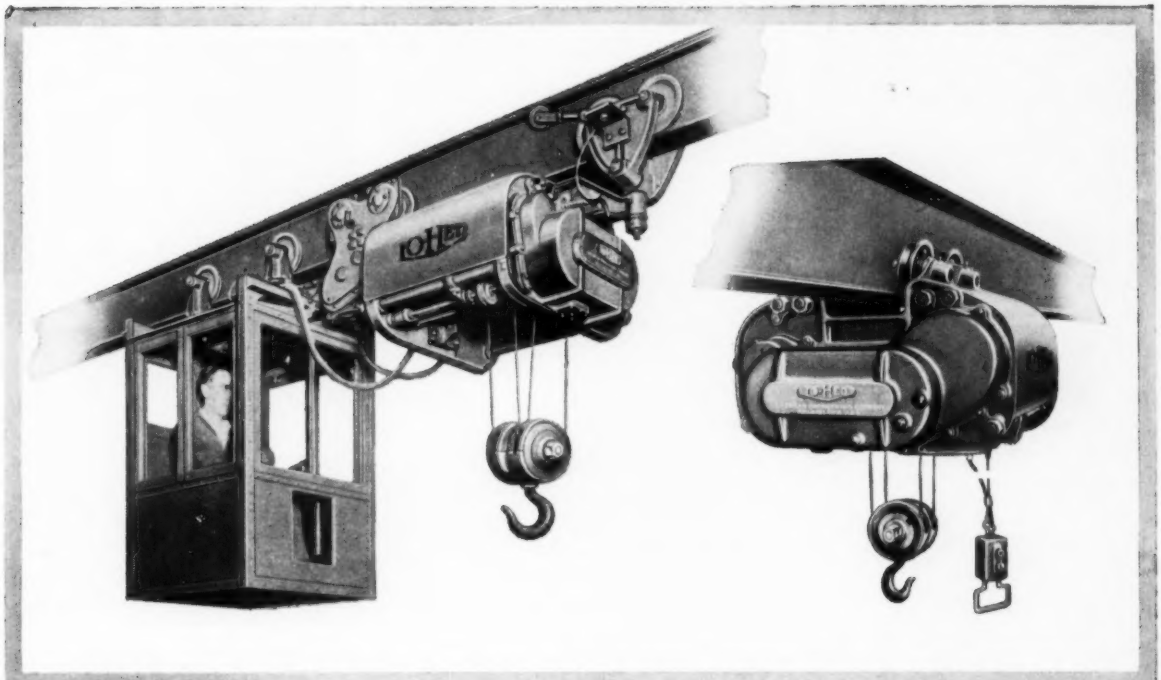

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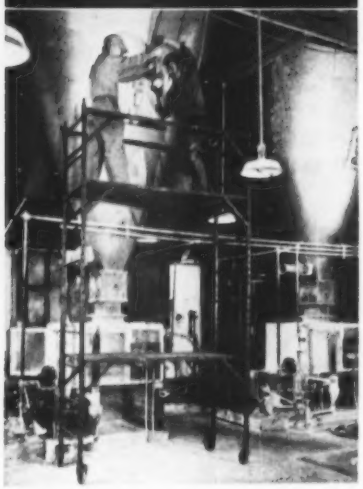

On many jobs, it is necessary for men to work as a "team". The large working platform area on Baker Adjustable Steel Scaffolds enables men to work together easier and with greater safety. Patented, self-locking platform support trusses permit fast erection and dismantling. Manual safety lock is provided, in addition to the automatic safety spring lock on platform trusses. Baker Scaffolds are complete with metal-bound plywood platform that is adjustable every 3 inches . . . permitting workmen to stand at the most efficient height for their job. Locking casters lock both wheel and swivel. Baker Adjustable Steel Scaffolds encourage your men to *work faster*, with greater *safety*.

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# DATA FILE

(Begins on page 171)

subject of this comprehensive 24-pp booklet. Tells how cloth-tube type dust collectors are handling complex problems in 33 typical installations, all illustrated. Covers use of these collectors in chemical processing, coal cleaning, sewage disposal, many other applications. American Wheelabrator & Equipment Corp.

## BOILERS, GENERATORS

**247 Re-Circulation Steam Generator**—Here's a 6-pp folder introducing a controlled re-circulation steam generator, describing its developments and uses. Combustion Engineering, Inc.

**248 How Much for Steam**—Here's a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

**249 Shop-Assembled Boiler**—Sixteen-pp Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

**250 Steam Generators**—Illustrated Bulletin SB43, 20 pp, describes company's VL factory assembled generators combining 2-drum water-tube boiler, integral water cooled furnace, brick work, insulation and steel casing. A large cutaway illustration shows design details, and gas travel, circulation and furnace interior are also pictured. Use of the generator with various fuels and firing arrangements is covered, dimensions included. Erie City Iron Works.

**251 Packaged Steam Generators**—This new 16-pp booklet on steam generators is profusely illustrated in color providing photos, cutaway and schematic drawings and describing in detail the construction and operating principles. Explains induced draft, dry steam, four-pass downdraft design, 5 sq ft of heating surface per Bhp, flexibility of operation, and oil, gas and combination gas-oil burning equipment. Superior Combustion Industries, Inc.

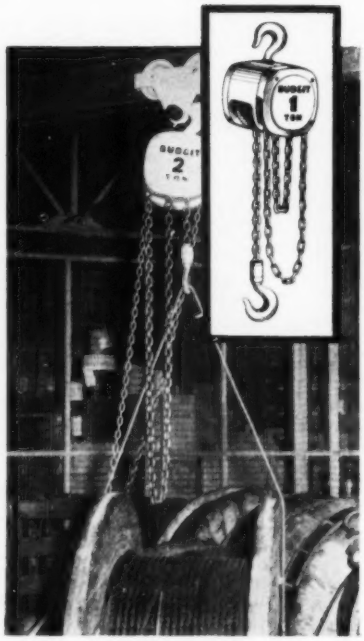
## PUMPS, COMPRESSORS

**252 Installing a Pump**—Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

**253 Pump Service Manual**—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity steam consumption curves, general information on water, properties of saturated and superheated steam. Warren Steam Pump Co., Inc.

**254 Data on Pumps**—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

**255 How to Solve Pumping Problems**—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical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The ¼-ton 'Budgit' Aluminum Chain Block weighs only 29 lbs. It's a one-man hoist — easy to carry, hang up, and use anywhere. In maintenance, emergencies, on loading docks, in construction — wherever tough lifting must be done, the knock-about 'Budgit' is the tough hoist for the job.

The 'Budgit' Aluminum Chain Block is made in ¼, ½, 1 and 2-ton sizes. Whatever capacity you buy, you can be sure of carry-around lightness, enduring strength and all-around safety. And when it comes to ease of use, the 'Budgit' gives you spur-geared efficiency that — in the ¼-ton size, for example — lifts the full load with a pull of only 25 lbs. on the hand chain.

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*'BUDGIT' I-BEAM TROLLEYS* enable your hoist to travel the load as well as lift it. Ball-bearing equipped. Adjustable to fit several I-Beam sizes. Capacities 500 to 4,000 lbs. Priced from $15.50. Write for Bulletin 390.

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A-676

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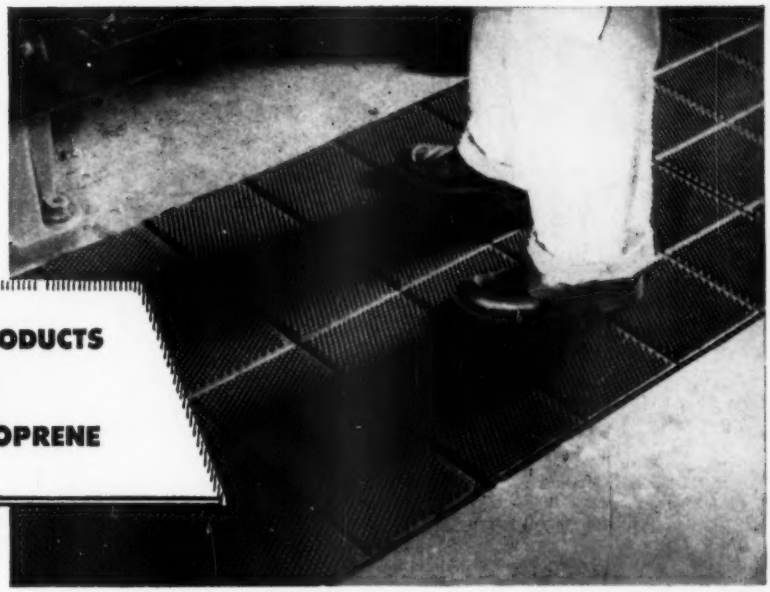

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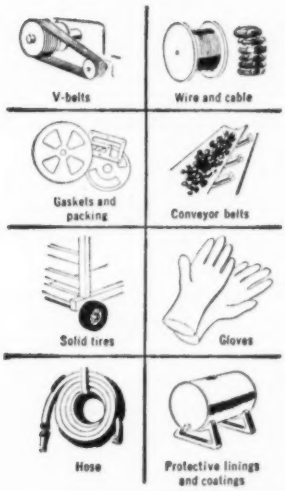


Resilient and durable, this neoprene mat assures long-lasting comfort and safety on jobs that require standing. Its pebbled surface is designed to prevent slips and skids—even when wet or oily.

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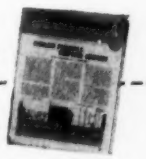

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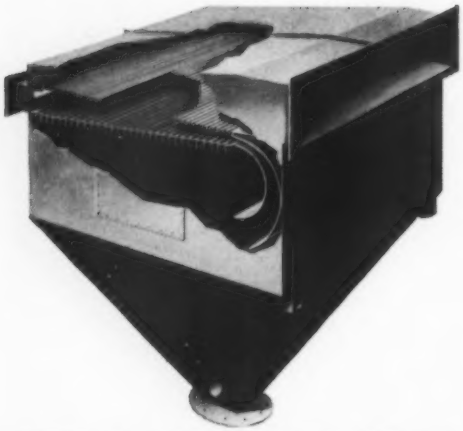

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# DATA FILE

(Begins on page 171)

information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

**256 Cradle-Mounted Pumps**—Sixteen-pp Form 7223, covering general purpose centrifugal pumps of the cradle-mounted type, presents five basic groups and 17 corresponding pump types, their capacities, horsepower ratings and uses. Includes dimensions and a table of performance under 60 cycle use. Ingersoll-Rand Co.

**257 "A Turn for the Better"**—Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

**258 Condensed Pump Data**—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

**259 Multi-Stage Compressors**—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

**260 Centrifugal Compressors**—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

**261 Improved Compressor**—How this manufacturer's Spiraxial compressor for air or gas is designed to provide peak efficiencies with minimum servicing is explained in Bulletin SC-152. Construction and design details are discussed in detail. Roots-Connersville Blower.

**262 Air Compressor Selection Data**—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

## VALVES, TRAPS, PIPING AND ACCESSORIES

**263 For Quick Valve Selection**—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

**264 Valves and Fittings**—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings.

# This complete AB-I Circuit Breaker line

## solves all your application problems

Here's how to wrap up every circuit protection problem in your plant—with the complete line of enclosed Westinghouse AB-I Circuit Breakers.

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# DATA FILE

(Begins on page 171)

Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

**265 Valve Maintenance Guide**—"Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

**266 Automatic Valves**—Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

**267 Valves for Processing**—General Catalog 1500 B, 20 pp, describes in detail the operation and performance of all of company's single seated valves—the Domotor, electo-pneumatic, handwheel and combination models. Optional assemblies for specialized applications are shown. Application information, operating characteristics given. The Annin Co.

**268 Efficient Flow Control**—Data on bronze, iron, steel and corrosion-resisting valves in a wide range of types, for oil, water, gas and low pressure steam. Shows how valves are designed for service, low maintenance. The Wm. Powell Co.

**269 Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

**270 Steam Trap Reference Manual**—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

**271 Steam Trap Book**—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

**272 Steam Hook-ups**—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

**273 Design Properties of Pipe**—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercial steel pipe. Tube Turns, Inc.

**274 Handbook on Fittings, Flanges**—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

**275 Packless Expansion Joints**—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated;


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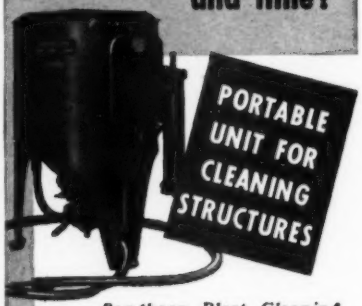


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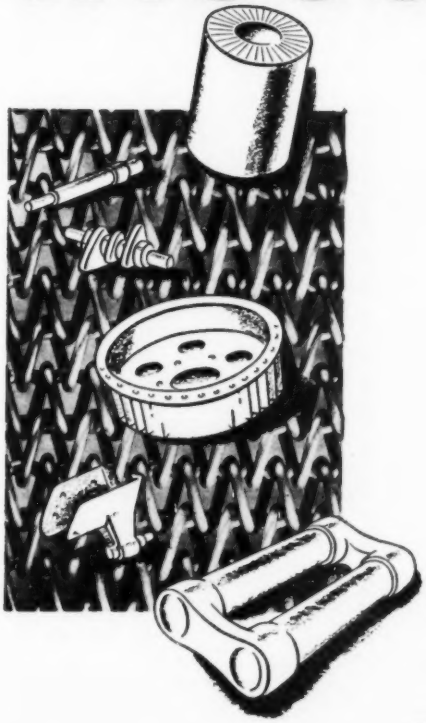

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(Begins on page 171)

simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

**276 Piping Pointers**—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

## FUEL OILS, LUBRICATION

**277 Versatile Industrial Oil**—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equiment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

**278 Cooperative Technical Consultation Service**—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

**279 Multi-Purpose Grease**—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrotion. Socony-Vacuum Oil Co.

**280 Lubricant Data Book**—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equiment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

**281 High Temp Lubrication**—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

**282 Force Feed Lubricators**—This catalog describes and illustrates force feed lubricators for positive and automatic lubrication of cylinders and bearings. Stresses accessibility of enclosed working parts, other design features. Manzel.

## ELECTRICAL

**283 Weatherized Motors**—Six-pp Bulletin 400 describes company's All-Weather integral motors for industrial use. These have full height protection, through ventilation, one-piece steel shell, interchangeability of end head. Robbins & Myers, Inc.

**284 Totally-Enclosed Motors**—Eight-pp Form 1784, illustrated in full color, presents a line of totally enclosed motors, including types for both hazardous and non-hazardous locations. Design details of the motors are shown in a large cutaway drawing, and special construction features are pictured. U. S. Electrical Motors, Inc.

**285 Motor-Generator Reference Book**—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their applications and operating requirements. Booklet is generously illustrated and includes performance data, ratings, informa-


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## DATA FILE

(Begins on page 171)

tion on methods of speed control, general characteristics. Allis-Chalmers Mfg. Co.

**286 Industrial Motors**—Twelve-pp Brochure 100 gives information on company's line of industrial motors. Construction details are discussed and drip-proof, splash-proof, totally enclosed and other types described and illustrated. Mechanical and electrical modifications possible are detailed and selection data included. Motor generator sets, brake motors, elevator hoist motors are shown. Electro Dynamics Div., General Dynamics Corp.

"Don't touch those wires, Bernie, if you don't want to be killed and get fired."

**287 Motor Handbook**—Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

**288 Bus Duct Manual**—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

**289 Plug-In Power**—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

**290 Power Distribution Feeders**—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution systems, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

**291 Power and Control Cables**—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

**292 Power Distribution Practices**—The 28-pp "Industrial Power Distribution Idea Book" (Bulletin GEA-5900) is a guide for plant engineers on electric power distribution practices in large and small plants. Covers utility distribution practices; methods of buying power; what to do when a choice of primary voltages is available; application of primary switches and circuit breakers; types and arrangements of primary cables; and types of load-center distribution systems. Also dis-

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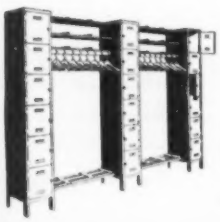

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# DATA FILE

(Begins on page 171)

cusses branch feeder switches, starters, and fuses, grounding of systems, interrupting capacity. General Electric Co.

**293** **Small Bus Duct**—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also trap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

**294** **Battery Technology Handbook**—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a section on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

**295** **Power Circuit Transformers**—By means of comparative wiring diagrams, 12-pp Bulletin 501-15 demonstrates the economy and system simplicity afforded through the use of company's power circuit transformers in handling lighting and low voltage features of these dry type transformers, their use in converting old installations, isolating service. Jefferson Electric Co.

**296** **What You Should Know About Circuit Breakers**—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

**297** **Circuit Breaker Reference Data**—Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

**298** **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. Lists applications for these starters and pictures variety of enclosures available. Square D Co.

**299** **Snap Action Switches**—Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

**300** **Preventive Maintenance Tips**—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls is given. Westinghouse Electric Corp.

**301** **Electrical Equipment for Cranes**—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.

**302** **Retractile Cords**—This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos,

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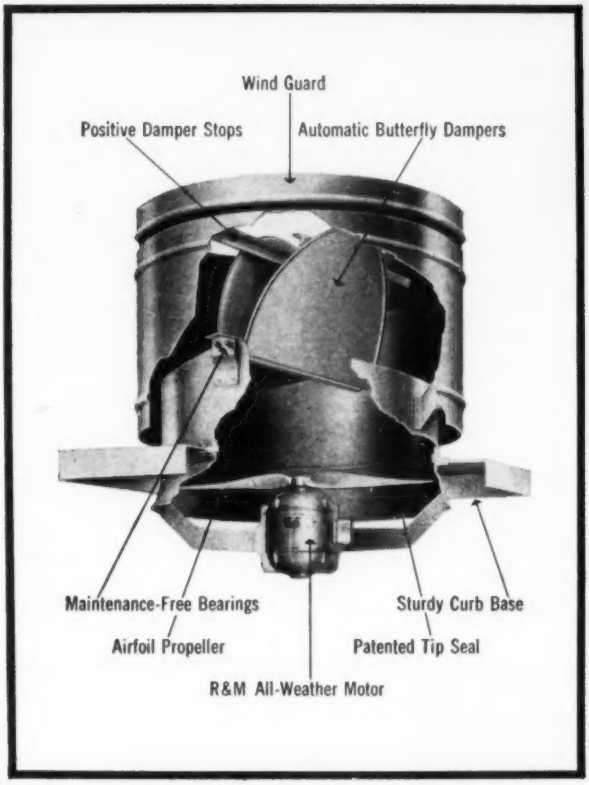


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Famed airfoil propeller, powered by the *All-Weather* Robbins & Myers motor, sweeps up heat, moisture, dust, fumes—then *blasts them high into the outside air.* Wind guard and throat design assure constant performance regardless of wind.

Automatic butterfly dampers open wide on minimum fan pressure for guide vane effect and virtually unrestricted air flow. Galvanized roof over damper shaft and bearing supports provides rainshed when fan is not operating. Easily mounted on any type roof, Sky-Blast provides air deliveries up to 78,800 CFM. Low silhouette cuts down roof stresses. Our engineers will be glad to give you free advice on any ventilating problem.

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*Below:* Illustration from new bulletin shows conveyor discharging metal chips into tote box.

**Hapman CONVEYORS, INC.**
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OTC

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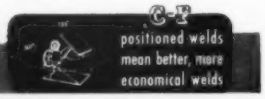

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# DATA FILE

(Begins on page 171)

explains how the cords are made, where used, advantages. Koiled Kords, Inc.

**303 Cable Clips**—Data sheets are available on cable supports made of ethyl cellulose designed to give excellent performance under ordinary service conditions. Information given covers properties of ethyl cellulose, sizes. Weckesser Co.

## WATER CONDITIONING

**304 New Data on Zeolite Softeners**—Publication 4520-A is a recently revised edition of company's booklet on zeolite water softening. Provides a glossary of terms used in the process, data for laying out a zeolite softening plant, factors governing size of equipment, selection of zeolite materials and discussion of the four stages of operation of a sodium zeolite softener. Cochrane Corp.

**305 For Conductometric Determination of Solids**—A quick and simple method for determining solids contents of boiler water or condensate is explained and illustrated in Bulletin TRE50. Hall Laboratories, Inc.

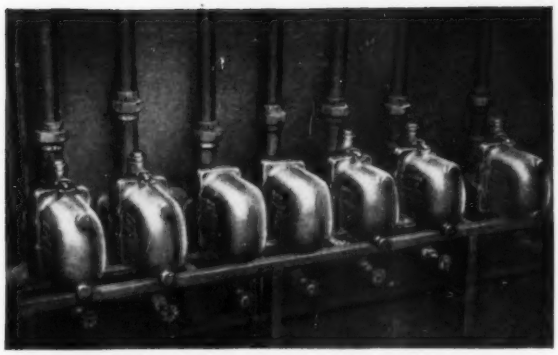
## LIGHTING

**306 Plant Lighting Planning Guide**—This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Mfg. Co.


# Facilities Engineer

The position of Facilities Engineer with large West Coast aircraft manufacturer is open to an experienced engineer with extensive background in large-scale manufacturing. Position entails administration of plant planning, construction, equipment, installation, financing and engineering. Give personal history, education, experience, etc., in first letter. Write

**Box 2017**
**c/o PLANT ENGINEERING**
110 S. DEARBORN ST., CHICAGO 3, ILL.



## 34,000 Pounds of Condensate

. . . must be removed every hour day and night from the steam coils in air driers processing salt at Manistee Salt Works, Manistee, Mich.

These Sarco float-thermostatic steam traps have been doing the job since 1948 without a break, at a steam pressure of 150 psi.

They can't air-bind because each trap is equipped with a standard Sarco thermostatic air vent. These vents operate on the balanced pressure principle and are unaffected by changing or fluctuating steam pressures.

Where very large volumes of condensate must be removed instantly, this trap has no equal. For additional information, write for Bulletin 450-10 to *Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.* *Advt. 604*

**For more facts circle 634 on Reply Card**

## Making Warm Friendships on Hot Jobs

PUMPS "by Aurora"
WATER JACKETED APCO PUMP
Developed especially for the efficient handling of high temperature and highly volatile liquids. Delivers outstanding performance. Unbeatable on high head, small capacity duties.
For Every Purpose
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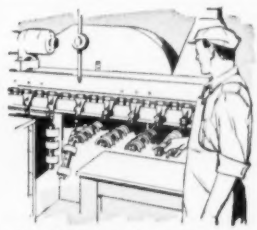
## See how Carboloy magnets save time, money in the shop

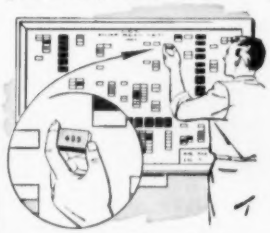
**FREE**
**PERMANENT MAGNET IDEA KIT**

**Send for free** magnet kit containing suggestions that really pay off in the plant. See how Carboloy permanent magnets can eliminate costly clamps, jigs, vises . . . how they'll save you time and maintenance costs. Magnets need no electric power. Cost nothing to operate – last forever.

**Shown below** are a few of the ways magnets are used as mechanical holding devices – working better, cheaper, faster than devices previously used.

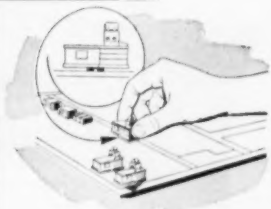


In plating-rack conveyors, for example . . .



to show traffic on vehicle dispatch board . . .

to attach ground from portable welders . . .



or to simplify plant layout planning.

### Get a "You-Try-It" Magnet Assortment

**Shop Package No. 1** – Contains 48 Carboloy Permanent magnets: 8 styles – 3 pairs each. Magnetic pull up to 2 lbs. per magnet. Price $10.00. Send coupon today.

**Shop Package No. 2** – Contains 18 magnets: 4 styles – 2 pairs each; and 1 style – 1 pair. Magnetic pull from 3 lbs. to 12 lbs. per magnet. Price $15.00. Order today.

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BASKET TYPE

# STRAINERS

- Large Strainer Area!
- Low Pressure Drop!
- Easily Cleaned!

Davis Basket Type Strainers are used on pressure and suction pipe lines for the protection of meters, valves, pumps and other equipment. The No. 76 Strainer has a cylindrical basket with perforated sides and bottom supported at the top by a flange. When the cover is removed the basket may be lifted out easily for cleaning. Large body passage reduces pressure drop across the strainer to a minimum. The size of screen perforations depends on the fluid being strained and the foreign matter in suspension. Ask for recommendations.

**DAVIS No. 76 STRAINER SIZES ½" to 14"**

**Davis**

DAVIS REGULATOR COMPANY

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**For more facts circle 637 on Reply Card**

## This belt never stops

### Do you need strong belting, too?

This remarkable Imperial Belt was installed in Chicago's Union Station as a mail bag conveyor in the summer of 1945. For more than seven years it has operated almost continuously—24 hours a day, seven days a week. The only exception is when power shutoffs or blockades occur. Such rare stoppages last only a few minutes. The belt that has turned in this tremendous service record is an Imperial Black Rexall, 36" x 4-ply, 410 feet long. It is one of more than 20 Imperial Black Rexall conveyors in the Chicago Union Station—belts whose aggregate length is 6740 feet, or well over a mile.

### Belting Job-Designed for You

Imperial Black Rexall is chosen for jobs like these because of its great strength and toughness. Constructed of tight-woven heavy-duty silver duck, it is double-stitched and inner-locked to prevent ply separation and is impregnated with a special compound that strengthens, lubricates and preserves the fibers. Black Rexall Belting is unexcelled for conveyors and elevators handling heavy or semi-abrasive materials.

Whatever your belting need, there is a job-designed Imperial Belt to fill your requirements and cut your handling costs. Write for Data Sheet 48-4A and prices.

**Imperial**

**BELTING CO.**

*1759 S. Kilbourn Ave.*
*Chicago 23, Illinois*

*Engineered Belting—*
*The Right Belt for Each Job.*

**For more facts circle 638 on Reply Card**


# DATA FILE

(Begins on page 171)

**307 Selection Data on Lighting Fixture Hangers**—Catalog 50, 80 pp, contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

## PACKINGS, SEALS

**308 Buyer's Guide on Packings**—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

**309 Shaft Seals**—Form 455, 12 pp, presents a mechanical seal that rotates with the shaft and is designed to meet sealing requirements of centrifugal and rotary pumps, agitators, blowers, other rotating equipment. Explains advantages of these seals, gives recommended uses for six types, also for a double seal and a cartridge sleeve seal. Durametallic Corp.

**310 Braided Rod Packing**—This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustrations of types available, tables of service recommendations, specifications and reports from uses. The Garlock Packing Co.

## INSTRUMENTS, CONTROLS

**311 Wide Range Regulator**—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

**312 Gages for Many Jobs**—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

**313 Fundamentals of Instrumentation**—Booklet 80-2 illustrated, offers 126 pp of information on instrumentation in industry. Separate sections are devoted to the fundamentals of measurement and control, measurement of process variables, remote transmission of measurements, automatic controllers, power units and final control elements, control systems and panelboards. Available to qualified plant engineers. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.


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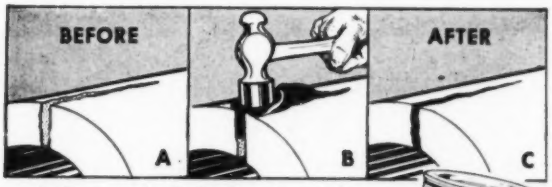


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Smooth-On No. 1 Iron Cement is a metallic powder which you mix with water to the consistency of putty. You tamp it, while still soft, into a crack or hole, making sure to force it against all surfaces. With Smooth-On you don't need to use heat or special gadgets. As it hardens, it expands slightly, clinging tightly in place. The repaired part is ready for use as soon as Smooth-On sets hard. Keep Smooth-On handy for both emergency and routine maintenance repairs. Buy it in 7 oz., 1 lb., 5 lb., 20 lb. or 100 lb. size. If your supply house hasn't Smooth-On No. 1, write us.

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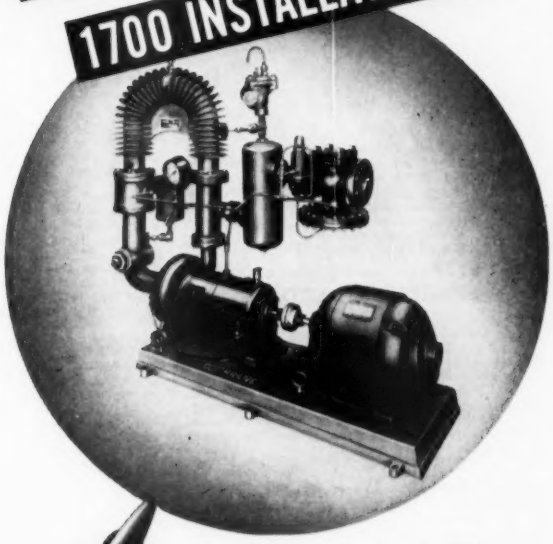

*Production soars with "JET" handling of condensate with a*

# cochrane C-B CONDENSATE DRAINAGE SYSTEM

Over 1700 installations in every kind of steam process work, prove that the Cochrane "JET" principle of condensate drainage steps up production, cuts fuel costs and improves quality.

**Up to 35% increase in production has been achieved.** The Cochrane "JET" unit removes "insulating" layers of condensate from all types of steam processing equipment continuously and effectively. It produces faster, more efficient heat transfer; eliminates cold starts; speeds cooking, drying and curing cycles.

**Improved product quality.** The Cochrane "JET" unit levels out heat fluctuations—maintains uniform intense heat transfer, producing better quality product in less time.

**Lower fuel and maintenance costs.** The Cochrane C-B system chops fuel costs by 10% or more returning condensate to the boiler or "make-up" system without appreciable pressure or temperature drop—cuts make-up water requirements—eliminates flashing—reduces boiler room maintenance, automatically separates entrained air and corrosive gasses from returned condensate.

**Write today** for full information on how a Cochrane C-B High Pressure Condensate Drainage Control System can help you when used with . . .

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cochrane corporation
*3126 N. 17th Street, Philadelphia 32, Pa.*

For more facts circle 641 on Reply Card

# DATA FILE

(Begins on page 171)

## TUBING, HOSE

**315 Tubing for Many Jobs**—Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube B, two types of lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of fabric. Gives applications of both types. Flexible Tubing Corp.

**316 Hose and Tubing**—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

## MATERIALS HANDLING

**317 Data on Tramrail Equipment**—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

**318 Handbook on Overhead Conveying Systems**—Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering data. Richards-Wilcox Mfg. Co.

**319 For Overhead Handling**—This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.

**320 Engineered Monorail Applications**—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

**321 Safe Truck Operation**—"Safety Saves!" is a 24-pp booklet setting forth "do's" and "don'ts" established as a practical code of truck operation. The admonitions, pointed up by cartoons, serve as both "refresher course" and text. Industrial Truck Div., Clark Equipment Co.

**322 How to Pick a Truck**—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

**324 Materials Handling Equipment**—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

**325 Metal Conveyor Belts**—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

**327 Conveyor Belting**—Twelve types of conveyor belting, for standard heavy duty and special applications, are described in this bulletin. Pictures the beltings in use, and discusses in detail some of the impregnations and coatings utilized. Main Belting Co.

**328 Cost-Cutting Conveyor Units**—Standardized gravity and power units covering a wide range of conveying jobs are described and pictured in Bulletin 63-C, 30 pp. Roller, wheel, and belt conveyors, elevating units, drives and accessories are presented, along with specifications. Practical in its approach, this book offers ideas for the use of these units. Standard Conveyor Co.

**329 Tubular Conveyors**—Form HC-541 contains about 44 pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

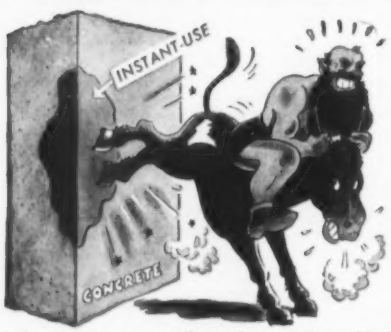
**330 Sheet Lifters**—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

**331 How to Operate a Crane**—Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the co-ordination of crane motions and includes safety rules and inspection, maintenance tips. Individual copies of this book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

**332 Manual on Electric Hoists**—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains funda-


# INSTANT-SETTING PATCH

*REPAIRS YOUR BROKEN FLOORS IN A HURRY!*

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**WON'T CRACK or CHIP OUT!**

**All You Do Is TAMP SMOOTH —TRUCK OVER!**

No traffic tie-ups. To patch broken factory floors—simply shovel INSTANT-USE into hole or rut—tamp smooth—truck over! No waiting! INSTANT-USE bonds tight to old concrete—right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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# *Being Completely Satisfied* COSTS NO MORE

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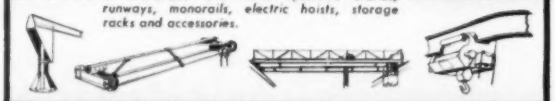
**Complete crane installations Job Engineered and manufactured by ABELL-HOWE are certain to SATISFY . . . INVESTMENTWISE and PERFORMANCEWISE**

When you are considering overhead materials handling equipment it is well to consult ABELL-HOWE on Complete Crane Equipment and Service.

*Ask for catalog C114*

*The Abell-Howe line includes a wide range of motorized and hand operated cranes, runways, monorails, electric hoists, storage racks and accessories.*



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# Reduce Wear with Stock Bars of AMPCO* METAL

**Grade 18, Centrifugally Cast**

AMPCO METAL Grade 18 stock bars are a real convenience — you carry the sizes most generally used. Prompt delivery from our Milwaukee stock on all other sizes.

Centrifugally cast Grade 18 stock bars are carried in all sizes from 1⅛" to 3⅞" I.D., 1¾" to 6" O.D., 12½" long, rough bored and faced one end. Solid extruded bars, cut to desired lengths, are also available.

Write today for your free wall chart and a 4-page data sheet listing physical properties and recommended usages.

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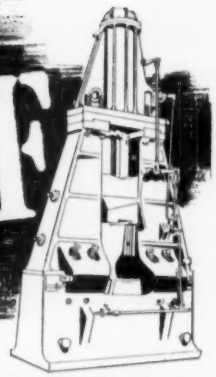
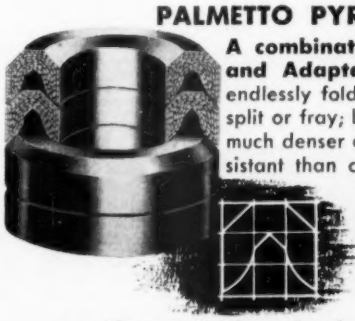
# The PROOF of the PACKING ...is in the TESTING



**Palmetto Pyramid: 17 to 7** — At the Canton Drop Forgings and Mfg. Co., a 5000 lb. Steam Drop Hammer was used to compare Palmetto Pyramid #2500 with a conventional square packing. Results: 24 lbs. of square packing were used in 7 weeks. After the initial packing — rings were added 2 or 3 at a time. This means approximately 3 complete sets of square packings in 7 weeks.

*ONE SET OF PYRAMID #2500 (NO RINGS ADDED) LASTED 17 WEEKS!*

## PALMETTO PYRAMID



**A combination of Strength and Adaptability.** Made of endlessly folded fabric, it can't split or fray; being molded, it is much denser and more wear resistant than conventional packings; asbestos-reinforced, it can withstand temperatures of 600° F.; patterned on a square, each ring provides a solid base for the one above. This strength, combined with the flexibility of Palmetto Pyramid's design, provides the formula for real heavyweight service.

## FOUR WAYS FLEXIBLE

1. Single-line contact — facilitates instant response to pressure changes.
2. Lip curve — provides free entrance for pressure medium, assures positive sealing action and thorough lubrication.
3. Lateral surface — is largely sealing surface. Means fewer rings — less friction — longer life.
4. Automatic sealing — means tighter sealing with increasing pressure. But no binding — for adjustment is self compensating through internal pressure.

Palmetto Pyramid not only can take it. It can take it longer. Because it *rides with the punches* Send for catalog PC-102 covering complete Palmetto line.

Our 90th Year — Nearly A Century of Quality

PALMETTO Packings

*packing more performance into every application*

**GREENE, TWEED & CO.** North Wales, Pa.

**For mroe facts circle 646 on Reply Card**

# DATA FILE

(Begins on page 171)

mental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

**333 Locomotive Cranes**—Catalog 84, 16 pp, stresses advantages of the torque control unit used in company's cranes, and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

**334 Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

**335 Trolley Hoists**—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

**336 Shovel and Loader**—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

**337 Trucks, Casters, Wheels**—Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

**338 Data on Truck Casters**—As much specific information as can be presented in a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. The Bassick Co.

## INSULATION

**339 Pipe Insulation**—Form 76-102 is a small folder stressing efficiency and economy of Amocel, a lightweight asbestos pipe insulation for temperatures to 650 F. Discusses its low thermal conductivity, high mechanical strength in relation to its weight. Union Asbestos & Rubber Co.

**340 One-Coat Insulation**—This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from -40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

## MECHANICAL POWER TRANSMISSION

**341 Variable Speed Control Simplified**—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

**342 Improved V-Belts**—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

**343 Power Drive Handbook**—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

**344 Belts to Suit the Job**—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

**345 Brakes and Brake Motors**—Construction advantages of company's brakes are featured in illustrated Bulletin SL-610-1 on brakes and brake motors. Dimensions, mechanical and electrical characteristics. Crocker-Wheeler Div., Elliott Co.

**346 Manual on Power Transmission Machinery**—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering data, formulas. Dodge Mfg. Corp.

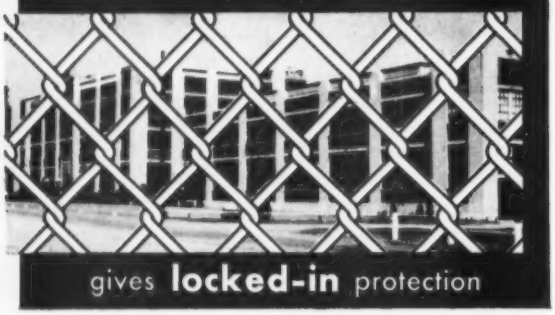
**347 Shaft Collars**—Steel shaft collars in 42 standard sizes for shafts from 3/16 to 3 in. dia are presented in this bulletin. Shows the collar in use on various types of machinery. Standard Pressed Steel Co.

## SAFETY, SANITATION

**348 Dry Chemical Extinguishers**—New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

**349 Hand Dryer**—Form 1123 describes and pictures a high-speed hand and face dryer for use in industrial washrooms. Tells special features, gives specifications. The Chicago Hardware Foundry Co.


REALOCK FENCE



gives **locked-in** protection

All fittings on Realock Fence have bolts so placed that nuts cannot be removed from the outside. This means that Realock Fence provides *added protection* for your grounds and property . . . effectively discourages tampering by would-be trespassers.

Strongly constructed, Realock Fence has high resistance to the elements because of a special galvanizing process . . . gives permanent protection and trouble-free service year after year. For additional information write our nearest sales office or consult your classified telephone directory.

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*Low Cost Protection for*

HEAT EXCHANGER TUBE ENDS

In the past 31 years Conseco has provided millions of Flowrites for tube inlets of heat exchangers operating in all industries and all applications. Tube inlets become eroded and worn long before the remainder of the tube, and by reinforcing the inlets it is possible to increase the effective tube life many times.

Flowrites—made of the same metal as the tubes—are available in any length, diameter or gauge. They are easy to install and remove by unskilled help. When Flowrites themselves become worn (*instead* of the tubes!), just pull them out and install new, longer Flowrites.

Get the facts from the 8-page Flowrite "proof" booklet, available upon request.

CONDENSER SERVICE & ENGINEERING CO.

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**FASTER HANDLING IN SHIPPING ROOMS . . . with the HANDIBELT**

Conveys bags, cartons, boxes horizontally or at any decline and incline angle within its range. Easily wheeled about by one man — easy to adjust and use — fits in crowded aisles, cars and freight elevators. Handles packages up to 135 lbs. TWO SIZES: No. 11 Handibelt, 11 ft. long, piles to 7 ft. 6 in; No. 16, 15 ft. 9 in. long, piles to 10 ft. 6 in. Write for HANDIBELT Bulletin — address Dept. PE-63.

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## WARE HI-LAG *Renewable* FUSES

***Wide Double Contact Surfaces — Spring Tension Locking of Links***

**KNIFE-BLADE**
250 VOLTS
600 VOLTS
70 to 600 AMPS.

**FERRULE**
250 VOLTS
600 VOLTS
3 to 60 AMPS.

WARE HI-LAG Fuses provide extra wide contact surfaces on both sides of links and stronger connections. Link connections are held firm and tight at all times by large arched spring steel washers and heavy studded bolt, which locks the links into the circuit.

Expansion and contraction of metals during *Off* and *On* periods compress links. This fluctuation causes loose contacts and oxidization in other fuses, which finally result in excessive heating and unnecessary blows. WARE HI-LAG construction keeps contacts permanently tight, thus insuring low resistance and longer fuse life.

WARE HI-LAG has many exclusive features in addition to the above; including the Link Design-Double Bridge Knife-Blade Assembly-Gas Vents and Simplified Construction, only 3 Parts. That is why it is known as the World's Best and Coolest Operating Fuse made.

We manufacture all of our own parts and are making prompt deliveries.

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*Write for Brochure giving details of all the COOL FACTS, sizes and prices.*

**WARE FUSE CORPORATION**
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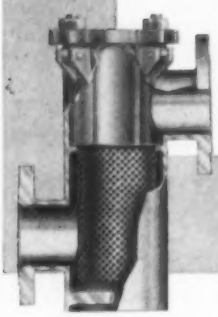
USE ADSCO

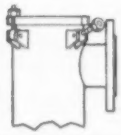


S-Type ADSCO Strainers screen out foreign matter from oil, water, and other liquid lines. Damage to valuable equipment is prevented. Usually installed on suction side but can also be used for discharge or other services.

S-TYPE

STYLE B COVER

Toggle and Bolt Type



Cover held in place by toggle bolts. This design simplifies removal of cover while cleaning basket screen. In sizes from 4" to 12", for pressures to 50 psi.

STRAINERS

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NORTH TONAWANDA, NEW YORK

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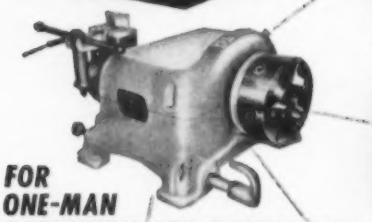
Introducing the NEW BEAVER Lightweight Aluminum Model-D Power Drive $202.50

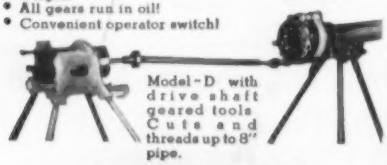
Beaver No. 102 — P D Wide Roll Pipe Cutter made especially for power drives.



Beaver Model 77-Drive Threader is ideal for use with new Model-D.

FOR ONE-MAN OPERATION AND PORTABILITY

- Works on bench, truck or pipe legs!
- Flat top serves as tool tray!
- Side openings give motor ventilation and act as hand grips for moving!
- Approximately 100 lbs. net weight!
- All gears run in oil!
- Convenient operator switch!
- Trouble-free, heavy-duty chuck with tons of gripping pressure!
- Safety-locked switch lever!
- Bronze spindle bearings!
- Attractive baked enamel finish!
- Parts interchangeable with Model-C.



Model-D with drive shaft geared tools Cuts and threads up to 8" pipe.

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# DATA FILE

(Begins on page 171)

**350 Advice on Washrooms**—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms which are included in this service. Scott Paper Co.

**351 Group Washing Equipment**—Washfountains designed for modern group washing requirements for industrial plants, institutions are shown in Bulletin D-766. Bradley Washfountain Co.

## OTHER EQUIPMENT

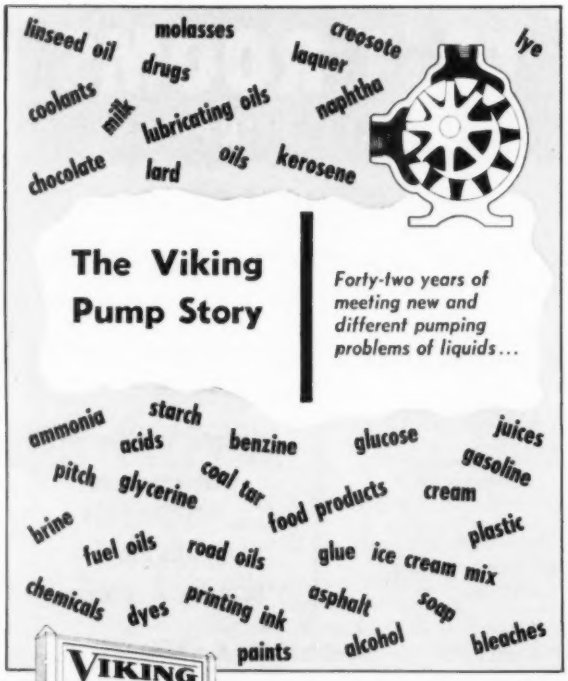
**352 Plumbing, Heating Supplies**—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, give sizes, intended uses and necessary ordering information. J. A. Sexauer Mfg. Co., Inc.

**353 Welding Fittings**—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section covering material specifications. Bonney Forge & Tool Works.

**354 Industrial Logistics**—Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

**355 Flexible Cords**—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives information on cord selection, how to order specialties. Whitney Blake Co.

**356 Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness,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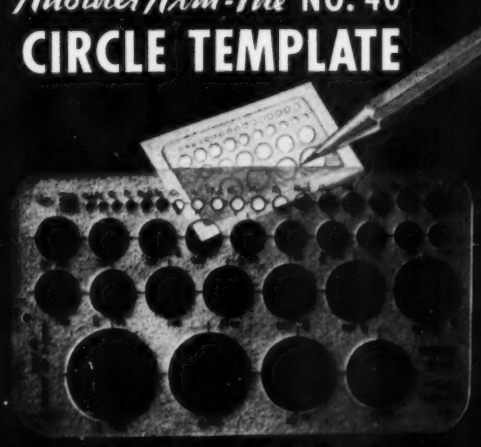

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***Write for your copy of the latest Main Belting bulletin.***

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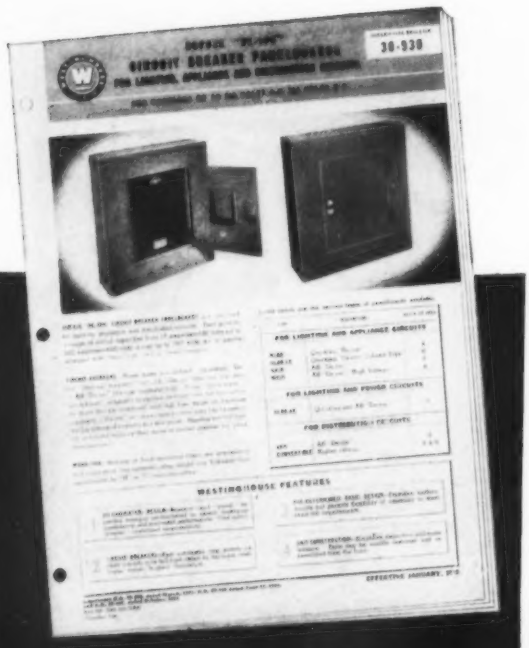


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You'll see other savings, too—how 13 Westinghouse manufacturing plants give local engineering and construction service, prompt delivery to meet close schedules—how Westinghouse Panelboard quality gives unfailing performance and greater protection.

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(Begins on page 171)

hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

**357 Good Place for Wraps**—Manufacturer's Lockerettes, modern scientific locker units combining best features of both lockers and coat racks are described and pictured in Bulletin 658. Vogel-Peterson Co.

**358 Finishing Systems**—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamels, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors and fog filters, metal cleaning and pickling equipment. The R. C. Mahon Co.

**359 Quenching Oils**—How the natural detergent qualities of this company's naphthenic-type quenching oils offers reduced maintenance and operating costs is explained in this little 8-pp folder. Tells how these oils can handle most all quenching jobs in industrial heat treating. Sun Oil Co.

**360 Standardized Spray Booths**—Literature is available on water wash, dry type, bench or leg type spray booths, based on standard panel sizes. Stresses easy erection, lower costs. The DeVilbiss Co.

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(Begins on page 171)

**361** **Time-Saving Templates**—Catalog 50 is a concise 8-pp ordering guide picturing and describing more than 40 drafting templates covering a wide range of engineering symbols. Includes electrical, piping, processing, welding, instrument, gears, fasteners. Prices given. RapiDesign Inc.

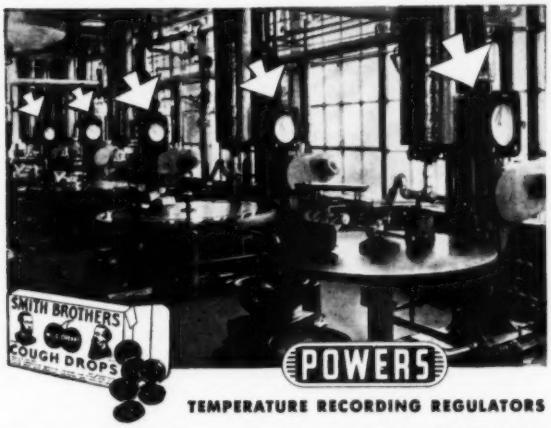
**362** **Wire Rope, How to Use It**—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. Also presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

**363** **Industrial Leathers**—These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also give data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

**364** **Magnets in Stock**—A complete listing of stocked sizes and shapes of Carboloy Alnico permanent magnets is provided in 20-pp Bulletin PM-100. Contains pull curve and size information in tabular form on both cast and sintered types, as well as sizes and application data on holding assemblies, including sheet steel separators, magnetic retrievers and stands. A list of available patterns for various sizes of cast Alnico bars, blocks, rods, wings and sleeves is included. Carboloy Dept., General Electric Co.

**365** **Hints on Babbitting Practice**—In outlining basic steps for the prevention of common bearing failures, Bulletin 146, a little 16-pp booklet, covers everything from the choice of metal for a particular bearing application through the correct pouring practice to in-service maintenance. Proper lubrication, a maintenance schedule, and operation at correct speed are discussed. Federated Metals Div., American Smelting and Refining Co.

**366** **Steam Condensers**—Bulletin 102, 24 pp, is a comprehensive presentation of manufacturer's steam condensers and includes photos of six typical installations as well as a section of engineering data, a discussion of air removal equipment and condenser maintenance. Condenser Service & Engineering Co., Inc.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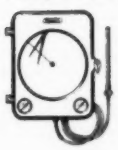

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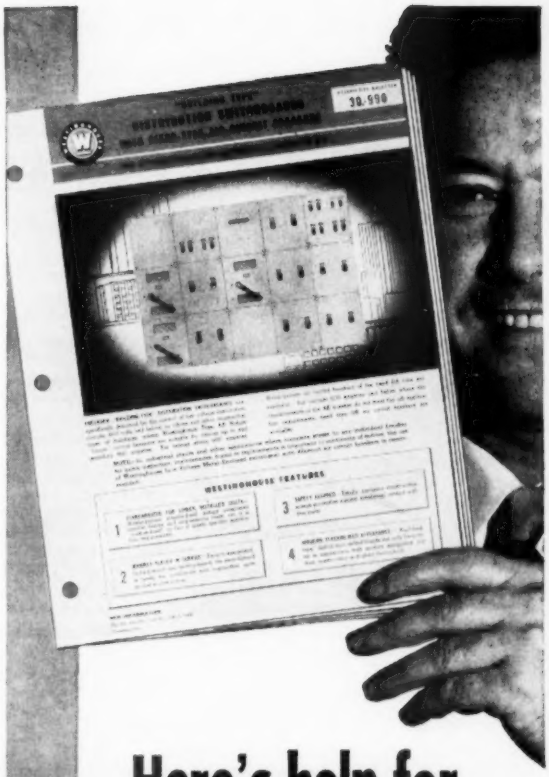

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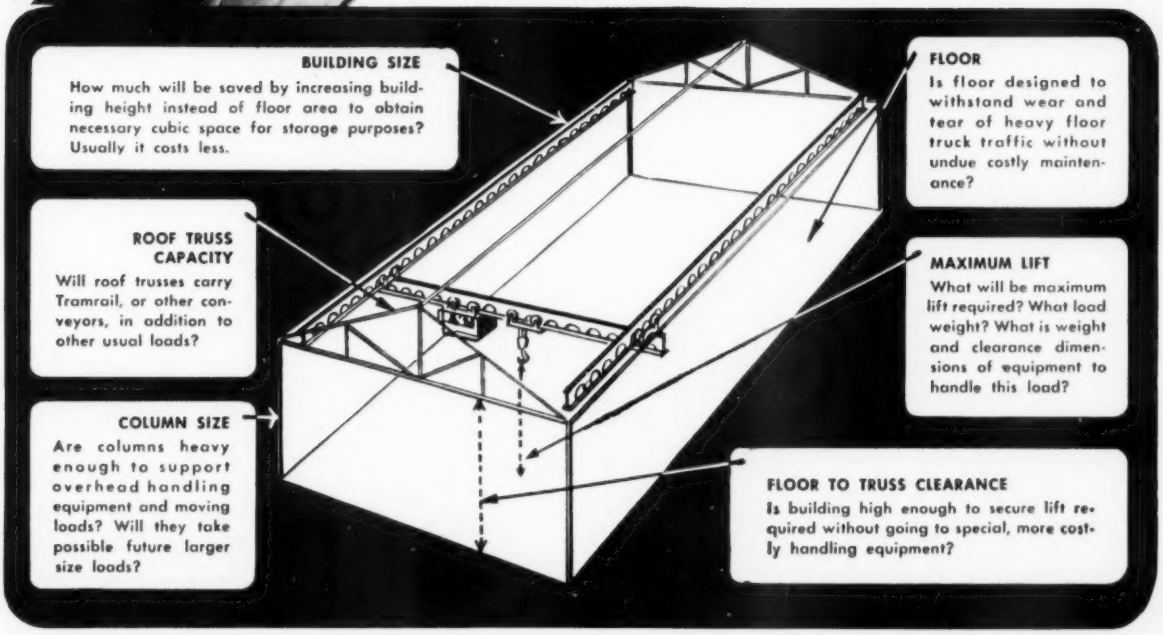
# Don't Forget *Materials Handling* When Designing the Building


BUILDING SIZE
How much will be saved by increasing building height instead of floor area to obtain necessary cubic space for storage purposes? Usually it costs less.
ROOF TRUSS CAPACITY
Will roof trusses carry Tramrail, or other conveyors, in addition to other usual loads?
COLUMN SIZE
Are columns heavy enough to support overhead handling equipment and moving loads? Will they take possible future larger size loads?
FLOOR
Is floor designed to withstand wear and tear of heavy floor truck traffic without undue costly maintenance?
MAXIMUM LIFT
What will be maximum lift required? What load weight? What is weight and clearance dimensions of equipment to handle this load?
FLOOR TO TRUSS CLEARANCE
Is building high enough to secure lift required without going to special, more costly handling equipment?

The foremost demand of a new factory building, whether for production or storage, is that its design and construction aid overall operating efficiency to the utmost. Thus, the building becomes more than just an enclosure, but is actually a vital part of the manufacturing process.

It is, therefore, imperative that the various steps entering into the making of an item be thoroughly considered when the building is designed. One of the most important of these concerns materials handing because this item often amounts from 25% to 50% of the total production cost, and, also, because it is plant-wise in nature.

Regardless of what handling methods are deemed best, overhead cranes or Tramrail, roller or chain conveyors, floor trucks, etc., the building design, size and construction usually has a tremendous bearing on the ultimate handling efficiency secured. Building clearances, floor construction, column locations, aisleway allowances and other factors must be considered for the different handling methods for most satisfactory results.

For initial economy in installation, for most satisfactory operation and highest efficiency, plan for materials handling when you design the building. ***Do not make materials handling an afterthought.***

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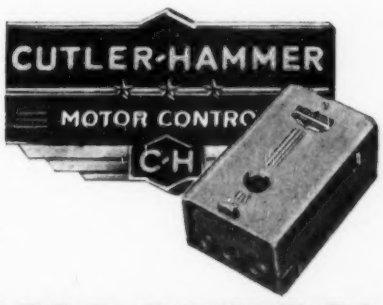


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# Plant Engineering

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